INDIAN FOOD INDUSTRY

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A PUBLICATION OF ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA)

VIEWS
Borderless Food Technology

Advances in Poultry Products Technology

Value-added Poultry Products

Pollutants in Livestock Products

Edible Film from Shark Meat

Resources for Protein Production

ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA), MYSORE - 570 013

Telephone : 515557 - Fax : 518670 - E-mail afsti@blr.vsnl.net.in

- Affiliated to the Institute of Food Technologists, Chicago, Illinois, U.S.A.
- The Association is a professional and educational organization of Food Scientists and Technologists, with its headquarters at Mysore.
- The Chapters of the Association are located at Bangalore, Bhopal, Calcutta, Chennai. Delhi, Hisar, Hyderabad, Jabalpur, Jaipur, Jammu, Kanpur, Karnal, Kharagpur, Ludhiana, Manipur, Mumbai, Nagpur, Pantnagar, Parbhani, Pune, Thrissur, and Thiruvananthapuram,

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- Advancement of all the aspects of Science and Technology relating to Production, Processing and distribution of food, with the ultimate objective to serve humanity through better food.
- Promotion of research, development and training in the Science, Technology and Engineering of Food.
- To provide a forum for exchange, discussion and dissemination of knowledge and current developments, especially among Food Scientists and Technologists as well as the Public and Society at large.

Major activities:

- Publication of 'Journal of Food Science and Technology' (bi-monthly) and 'Indian Food Industry' (bi-monthly).
- Holding symposia/conventions on different aspects of Food Science, Technology and Engineering.
- Arranging Lectures and Seminars for the benefit of Members and the Public.

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- Membership is open to graduates and diploma holders in Food Science, Technology and Engineering as well as to those engaged in these professional activities.
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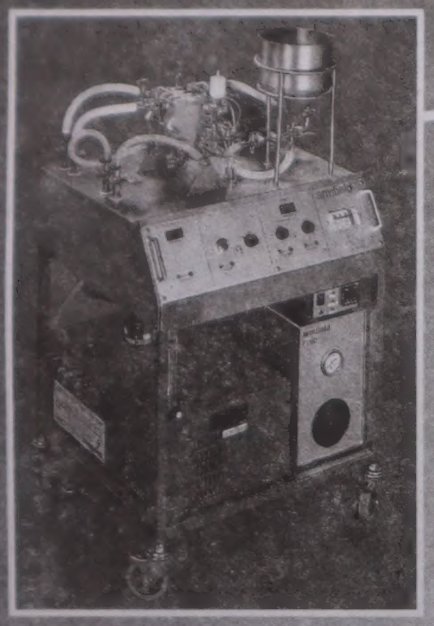

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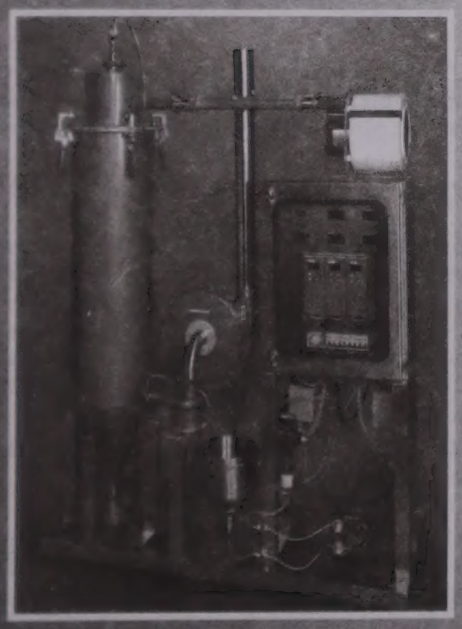

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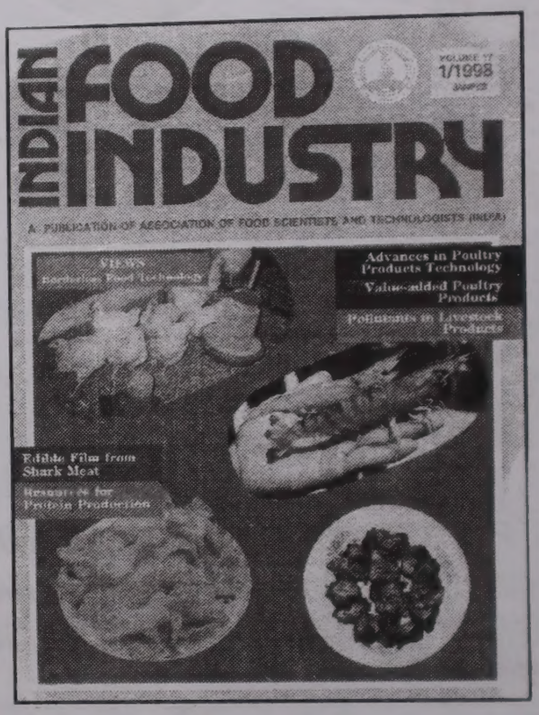

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Review articles, technology papers based on R&D work and reports on various aspects concerning food industry are welcome from food scientists and technologists from industry, research institutions and other related organisations. Contributors are advised to provide good quality illustrations in the form of charts and photographs along with the manuscripts. The Editorial Board reserves the right to edit the manuscripts in order to make them suitable for publication in the journal, while assuming no responsibility for the statements and opinions expressed by the contributors, nor will they bind AFST(I) in any way. Readers are free to air their views through letters which may be published in the journal from time to time.

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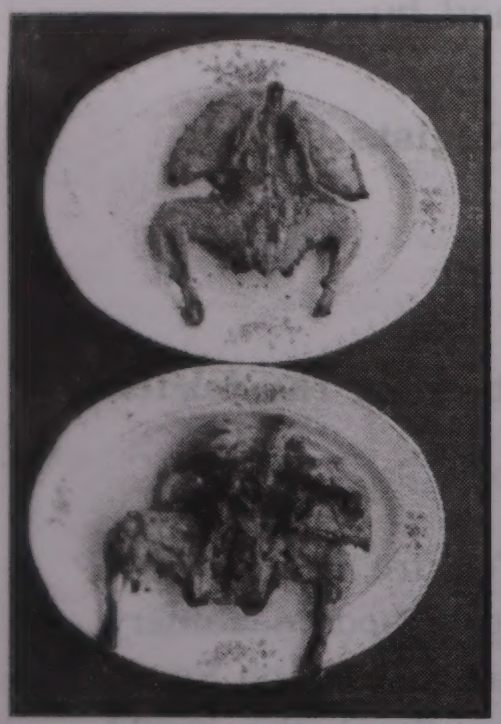

FROM
THE CHIEF EDITOR'S DESK

The question of vegetarianism or non-vegetarianism will be eternally debated with strong arguments, scientific, ethical or otherwise from either side. It is one thing to believe in something and practise it for one self, but another thing is to try to enforce on others, who do not believe in it. Undoubtedly, in the matter of food, scientific consideration alone should be the deciding factor. Indeed, basic dietary requirements can be derived from various sources, not necessarily exclusively from one or the other. Certain types of foods can become the taboo on health grounds like high fat, high proteins etc. People with tendency for kidney stones are advised to desist from taking oxalate-containing vegetables such as tomatoes or knol khol.

In this issue of IFI, we have highlighted the enterprise in non-vegetarian food items. The poultry industry has grown by leaps and bounds. We need to view this enterprise as an important potential of economic growth and asset of our country, besides enlargement of employment opportunities in both the urban and rural set up. On the food value, there is no question of meat, egg and fish as important sources of proteins, vitamins, minerals and fatty acids of physiological benefits. Non-vegetarian foods have remained expensive and beyond the reach of a wider section of Indian population, who are below the poverty line. The Food Industry could strive to look into ways and means of expanding the affordability of non-vegetarian items. Production costs could be brought down by product diversification. It occurs to me that one of the ways would be to develop by-products and value-added products from animal vicera, hair, hooves, feathers etc. These materials have been shown to be the sources of high value biochemicals. Several national laboratories have looked into these possibilities. Will the food industries turn their attention to this aspect ?

Richard Joseph

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INDUSTRY NEWS

Institute for Food Safety and Quality Proposed

To promote food safety and quality awareness in the country, the Confederation of Indian Food Trade and Industry (CIFTI) has proposed to set up a National Institute for Food Safety and Quality (NIFSAQ), jointly with the Ministry of Food Processing Industry, the Agricultural and Processed Food Export Promotion Authority and the Ministry of Health.

NIFSAQ would also attempt to provide the latest and authentic information relating to food safety and quality both to industry and consumer.

The objective of NIFSAQ is to ensure that all the processed agri-foods are manufactured in conditions, which lead to production of safe food. While the safety of agri-food products produced in the country was the ultimate responsibility of the food industry, the NIFSAQ programme would try and ensure that in registered establishments, appropriate steps were taken by the industry to produce a safe product for the consumer.

The programme is also designed to encourage the adoption of hazard analysis critical control points (HACCP) principles, which has been recognised as a logical tool towards a modern, scientifically-based inspection programme. It was intended that the programme be developed across all agri-food processed commodity groups and be fully implemented throughout the country by 2002.

The programme will provide the means to help inspectors proritise their responsibilities and focus attention on various points to ensure the production of safe food.

While the industry will be required to control and monitor its manufacturing process, maintain records on HACCP, the resources of the Department of Food Inspection will be utilised to check the adequacy of the controlling and monitoring of HACCP and verifying plant records of the monitoring.

The programme will also enhance the principle of shared responsibility for food inspection in the country by clarifying the roles and responsibilities of the Government and industry.

A New Modern Tea Bag Unit in Pune

India's first sealed tea bag unit is being set up by Hindustan Lever Ltd (HLL) in Pune. HLL is setting up this new, state-of- the-art, facility for exports.

The company already has a tea bag unit in Pune. HLL plans to eventually phase out the older technology and use the modern one.

In the new unit, tea bags will be made using the sealing method. Under the current method, tea bags come out in the stapled form. This will be Unilever's second such unit worldwide.

Globally, there are only three units using this technology, with Dilma of Sri Lanka, being the third.

The unit will have a capacity for 2000 tonnes by the end of December 1998. The investment of Rs.22 crores on four machines, is in the first phase and more funds will be deployed at a later stage, when the capacity is increased.

The tea bag facility will use the latest technology in the world. The traditional tea bag machines run usually on electrical circuits. This technology runs on electronic circuits.

HLL has identified tea bags, in addition to packet tea as a thrust area for exports.

HLL, which is also targeting the 'ready-to-drink' (RTD) tea market, is also in the process of setting up a tea upgradation facility in Calcutta. This is currently undergoing commission trials.

The modular plant, again the first of its kind in the country, will help make teas fit for use in the RTD tea markets in countries like Japan and Germany.

It will be a small unit of about 2,000 tonnes per annum. RTD tea market is a very lucrative but calls for stringent quality controls. While the RTD market itself may be difficult to crack, HLL, with this pilot plant, is aiming to get some of the processing business.

HLL is also establishing a green tea experimentation unit in Kerala. Green tea represents a huge market and HLL is looking at this sector for exports.

HLL is also looking at introducing natural flavoured teas like ginger, mint, cardamom, masala teas for the Far East markets.

A mixture of coffee, sugar and milk, this RTD coffee under the brand name 'Golden Eagle' will retail at the equivalent of Rs 4.50 per sachet.

The first consignment has been sent to the Far East, where RTD concept is very popular, especially in the Institutional segment.

Maharashtra Bans Molasses Export

A steep fall in the production of molasses in Maharashtra has prompted the State government to put a blanket ban on export of this commodity to safeguard the interests of the domestic consumers. The State's molasses stocks stood at 5.7 lakh tonnes by the end of June last year as against 10.7 lakh tonnes recorded during the same period in 1995-96 a comparative shortfall of five lakh tonnes.

The fall in molasses production is attributed to a drop in the sugarcane production in 1996-97, which is estimated around 325 lakh tonnes as compared to a bumper crop of nearly 475 lakh tonnes in 1995-96. State government had to stop exports of molasses, as the available stocks had reached a precarious level. the consumption of molasses by the end of the current season was expected to be around 4.6 lakh tonnes, while the available stock was 5.7 lakh tonnes, leaving a meagre one lakh tonnes margin.

Experts in the field point out that the sugarcane production in the State has been showing a cyclical pattern for the past few years. A bumper crop one year invariably leads to a drop the next year because of the glut created by the production earlier. The 1995-96 cane production was so high that it led to an unprecedented production of molasses so much so that it had to be stored in the open pits at the cooperative factories due to lack of storage space. This has prompted the State government to allow liberal exports of molasses and alcohol to clear the glut.

Industrial Use of Recycled Water

Bangalore is one of India's largest industrial centres. The city has seen a steady increase in the demand for recycled water. The demand today is around 100 million litres per day (MLD) and is expected to increase to many folds over the next eight years.

This industrial requirement is being met with domestic potable water right now. This puts a strain on the ever increasing demand for drinking water. With the booming population and dropping water tables, it will not be possible to meet both domestic and industrial requirements with the available water resources. The only alternative is to treat sewage water and use it for industrial requirements.

The Bangalore Water Supply & Sewerage Board [BWSSB] is operating a 163 MLD sewerage treatment plant at Challaghatta near the airport to treat sewage discharges from Koramangala and a large area of central Bangalore. The BWSSB has plans to construct a 50MLD tertiary treatment plant at this site. This plant would further purify the sewage water and make it good enough for industrial use. The tertiary treating of sewage water would ease the pressure on domestic grade supply.

Water treated by the tertiary plant can be used in boiler feed, processes, air-conditioning, cooling, fire protection, sanitary maintenance and gardening. This project would meet the demands of the industries on the Hosur Road, Mysore Road, Whitefield and Peenya.

The secondary sewage treatment plant near the airport has a capacity of 163 MLD. The conventional activated sludge process is used for the secondary treatment. The required equipments such as screens, detritor, primary clarifiers, aeration tank, primary sludge recirculation pump house and drying beds would be provided. The treated effluent discharged from this unit conforms to stipulated standards. The next process would be to provide for nitrification, prechlorination and a series of treatment systems to further purify the water. The effluent after treatment will be stored in tanks and later pump to industrial area. The approximate cost of incorporating the total process would be around Rs. 30 lakhs. The BWSSB has initiated this major step towards solving the water problem of Bangalore city.

Vanilla Cultivation in Karnataka

In order to promote vanilla cultivation in Karnataka, the State horticulture department has formulated a plan to equip farmers with the latest technology and knowhow to take up vanilla cultivation.

Dr.G.K. Vasanth Kumar Joint Director (plantation crops), Department of Horticulture, noted that vanilla was cultivated in the unorganised sector in Karnataka with a marginal area under coverage.

He said that the plan had been cleared by the State planing department and was awaiting final clearance from the State finance department. Since the cost of production was very high in the initial stages, the programme aimed at providing planting material to farmers at a lower cost. The initial outlay for the plan will be around Rs 35 lakhs.

The global demand for vanilla is increasing at a rate of

12.5 per cent annually. An interesting fact is that synthetic vanillin (the essence) constitutes 95 per cent of the total vanilla flavour industry.

The global vanilla production is estimated at about 2,500 tonnes in which India's share is negligible. The island nation Madagascar is the world leader with a 50 per cent share of the global output, followed by Indonesia 25 per cent.

Setting up National Food Chain Board Recommended

The Confederation of Indian Industry (CII), has come out with a 5 point 'What to do' and 3-point 'How to do' recommendations to tap the potential of the Indian Food Industry, expected to grow three-fold to reach $60 billion by 2005. Creating awareness about the foodchain opportunity among Indian business houses, modernising and harmonising food legislation, avoiding taxation on food industry items and making contract farming enforceable are the five key recommendations made by the CII. CII suggests ways to implement the five-point recommendations, which include :- a) Creating a stronger foodchain focus in government organisation. This is to be done by bringing all the elements of the foodchain, which are currently under various ministries, through an apex ministry or a joint ministerial council. b) Constituting a national foodchain board to accelerate development, as the country has always succeeded whenever there was a national focus applied to mega-ambitions and c) To set up a development financial institution for the foodchain, since the scale of investment required is so huge that it could be better achieved with the involvement of a development financial institution.

UB to Sell Off Non-core Assets

The United Breweries Group has identified a phenomenal Rs 800- crore worth non-crore assets, which it intends to dispose of.

The move follows the group's decision to restrategise and concentrate on its core competencies. Above all, the funds released as a result of such divestment would go to retire outstanding debts.

Mr Vijay Mallya, Chairman of the UB group, said, that the primary objective was to remove the entire debt component from its balance sheet.

Mr Mallya said that in the past one year alone, the UB group had mobilised as much as Rs 300 crores from sale of business assets not considered core to the key activities, which are IMFL liquor and beer.

He said that the UB group has decided that not a single rupee in debts will remain in the books. He wanted to get rid of the entire debt burden and focus on internal accruals and funds mobilised through sale of non-core assets for future growth.

He further added that his strategy was to do away with debts and focus on increasing shareholder value through intrinsic strengths and better market capitalisation. The company's earning per share was already Rs 45 per Rs 10 paid-up equity share, which is phenomenal.

According to the UB chief said that the group was very strongly focussed on going global with own capacities in South Africa, USA, UK and Nepal, besides India.

UB group effected one of the biggest offshore investments in South Africa, when it spent almost $ 30 millions to acquire the National Sorghum Breweries in that country. As of now, the UB group owns 16 breweries there.

In USA, the group has recently acquired two large breweries. One is called Medicino, which owns a well-known brand of beer called the "Red Tail". According to Mr Kalyan Ganguli, CEO, breweries division, UB group, "Red Tail" is å very popular brand in the "boutique blend" segment in the US. It is generally a yuppie brand and commands a fairly impressive marketshare. The UB group's plan is not only to continue marketing "Red Tail", but also brew its "Kingfisher" brand in USA.

The second acquisition is the Saratoga Springs Brewery near New York, a 200,000 hecto-litre brewery. This facility will also be utilised to manufacture the Kingfisher beer, the brand which UB group is extensively promoting in the overseas markets.

Besides these facilities, the UB group owns one clean beer plant in Nepal and another in Kent, U.K, which is under contract manufacturing arrangement for brewing Kingfisher beer.

Alcohol Scenario

Alcohol-based industries have enjoyed a healthy growth in the country. The viability of the industry depends upon the continuous and adequate availability of alcohol so that the utilisation of installed capacity does not suffer for want of feedstock. Alcohol availability can be increased by increasing its production or by curbing its alternate uses. The industry mainly employs continuous processes to provide alcohol-based products.

The Government's prevailing policy for new units in the potable sector is to utilise feedstocks other than cane-molasses alcohol. This policy decision was taken to encourage the alco-chemicals industry. The Government has, however, overruled this policy under pressure from multinational companies in the potable sector and has permitted companies like International Distillers (India), McDonald & Mohan, Bacardi Rum and Pernod Racord to use molasses-based alcohol. This threatens not only the availability of feedstocks to existing units, but also stunt the growth of the alco-chemicals industry.

Alcohol is largely produced in States like Uttar Pradesh, Maharashtra, Tamil Nadu, Andhra Pradesh, Gujarat and Karnataka. The alcohol-based industrial units, on the other hand, are also located in several other States. In addition, periodical imbalances within the state and economics dictate the necessity of inter-state movement of alcohol. To make matters worse, States charge import and export fees on alcohol, even within the country. No other chemical or chemical feedstock is treated in this manner. There is no restriction on inter-state movement of alcohol-based products, and such restrictions on its feedstock is hardly justified.

In the Finance Bill 1997, duty on molasses was converted from 20 per cent on an ad-valorem basis, to a fixed rate of Rs 500/tonne and the excise duty amounted to Rs 100-20/tonne. In the 1997-98 budget, the Finance Minister has rationalised the excise duty on many items and has indicated that the excise duty should not exceed 18 per cent on an ad-valorem basis. However, for cane molasses, no reduction has been made in the specific rate of Rs 500/tonne excise duty, which works out to 50 per cent of the current molasses price.

UB to Launch Ice Beer, First in India

The UB group is set to launch a new lager product 'Ice beer' for the first time in the country. In the first instance, it will be available in Mumbai city.

Later it will be sold in select cities of Maharashtra only. Available in frosted pint bottles (330 ml), it will be priced at Rs 25, the same price as a canned Kingfisher in Mumbai.

Branded 'UB Premium Ice Beer', it is being positioned as a beer that will electrify ones senses. With this the UB is introducing a new concept into the beer category.

The rationale for introducing UB Ice is to create excitement in the target consumer group between the age group of 18-30.

UB has tried out a different packaging for this product, so that it would communicate by itself that it is an offering for young people and that it is different from Kingfisher. While the blue colouring stands for 'cool', a technology similar to that of a hologram has been used for typefaces.

Ice beer is differentiated from normal lager by its brewing process. It has a higher alcohol content at around 6 per cent against 4.3 per cent in Kingfisher.

UB's Bombay Brewery is currently undergoing expansion. When completed, it will have a capacity of 400,000 hectolitres. At that stage, the production of UB Ice will be shifted there from Bangalore.

The product, much later will be launched in Bangalore and possibly in Goa. However, there will not be a national launch.

UB expects to sell about 12,000/15,000 cases per month of UB Ice.

It may be mentioned that the Ice beer was first introduced in Canada by Labatt in 1993. Later, Fosters and Budweiser among others also introduced this product. It is a significant niche product in most beer markets.

Sugar Industry Fears Drop in Production

The Union Government's decision to peg the statutory minimum price (SMP) of sugar at Rs 48.45 per quintal based on a recovery of 8.5 per cent for 1997-98 cane crushing season is likely to produce an adverse impact on sugar production in the country, according to Indian sugar industry and trade circles.

Although the Union agriculture ministry was in favour of a sizeable hike in the price of sugarcane in view of the dwindling sugar output, the Union food ministry with an eye on the PDS price, had suggested accepting the recommendations of the Commission for Agricultural Costs and Prices (CACP) and had persuaded the Centre to fix the SMP for cane as recommended by CACP.

Sugar production in India has started declining since 1995-96 season. From 16.5 million tonnes achieved in that year, sugar output has dropped to 12.9 million tonnes in 1996-97 and is estimated still lower at 11.5 million tonnes in 1997-98.

Such dwindling trend in sugar production should have cautioned the Union government to initiate meaningful steps for encouraging sugar production in the country. But, it has not happened. Instead, the official decision to peg SMP for sugarcane to such a low level, in fact, cuts across the government's objective of maximising indigenous sugar production. Admittedly some incentives have been announced with a view to encouraging production in the

first one and half months during the current crushing season, but the more important aspect of cane price has been overlooked by the authorities concerned.

Indications are available that the government might have settled for an upward revision in SMP of sugarcane, as the food ministry is lately inclined to accept a hike up to Rs 52 per quintal. But if did not materialise as the Union finance minister was unwilling to increase subsidy on levy sugar and insisted that the government must simultaneously take a decision on SMP and issue price of levy sugar to which it was closely linked.

Soy Exporters Seek Changes in Quality Norms

Indian processors and exporters are seeking to change quality standards for soymeal following poor soybean harvest.

Around 250,000 tonnes of Indian soymeal were rejected at various ports in India and abroad in December last, and export demand is very thin because of the quality problems created by unseasonal rains.

Due to higher moisture, the protein is low and foreign buyers are rejecting Indian soymeal. Buyers were paying less for Indian soymeal, with price rebates of 4 to 6 per cent being offered this year.

Soymeal yellow was currently quoted at $231-232 per tonne against $270-272 last year. Soybean prices fell amid very slow buying by processors and increased arrivals in central India, where beans were quoted at Rs 10,800-11,100 per tonne, down from Rs 11,000- 11,300 at the same time last year.

Andhra Pradesh and Orissa Top in Seafood Exports

A good crop at the shrimp ponds, and higher realisation due to the weakening of the rupee against the US greenback has resulted in substantial growth of seafood exports from Andhra Pradesh, and parts of Orissa.

According to the Marine Products Export Development Authority (MPEDA), a government export monitor exports from the port at Visakhapatnam totalled 19,190 tonnes during April-December 1997, compared to the 14,065 tonnes achieved in the corresponding period of 1996.

Value-wise, the exports fetched Rs 650 crores against the Rs 428 crores during April-December, 1996. The exports during the first nine months of 1997 have already crossed the annual target of Rs 581 crores set by the Commerce ministry for seafood exports from the port of Visakhapatnam.

MPEDA is expecting the exporters to ship out at least 1,000 tonnes per month for the next three months, thereby crossing the tonnage target, as well.

Cultured shrimps formed a bulk of the exports and the ponds posted a good harvest despite the threat of disease.

The ban clamped by the European Union on Indian seafood in August last year had little impact on the east coast.

High Costs Damp Shrimp-farming Corporates

The cycle has not turned as yet for corporates with interests in shrimps. While shrimp farming by the corporate sector has virtually come to nought, only a few processing plants are operational. The worst hit are those with integrated projects.

The modern processing plants, including those of Suvarna, Rank and Nagarjuna group, in the Nellore-Ongole are lying idle. In fact, financial troubles reportedly forced the Nagarjuna unit to the verge of closing down. The Waterbase and Magunta are learnt to be processing small quantities.

DCL Maritech is processing shrimp bought locally and also from Chennai, Kochi besides seacatch, but even that is only to about 35 per cent of capacity. Excess capacity is being utilised by processing other marine products like fish, which, though are low-value products, help increase capacity utilisation and reduce losses. A few other units at which processing of shrimp is on are Innovative Marine and Indus Foods in Pamarru.

The reason for the dismal state of affairs is not far to see. Many corporates went in for total integrated projects, which pushed up costs. While hatchery and feed units did well farming was a failure. Losses over the previous seasons, contributed by disease, compounded by the high cost of working capital, practically declared the death sentence for corporate farms.

Industry observers say that just like in Indonesia and Thailand, the technical/technological problems can be sorted out to a large extent. New technology like use of chlorine, reservoir technolo-

gy which, involves allocation of space for water storage, chlorination and dechlorination, cuts into waterspread area, making it more cost-intensive, but that is inevitable.

However, small farmers are doing quite well. They are able to keep their overheads low and manage profits, even though the actual water spread area and the density of crop had to be scaled down and prophylactic measures to ward off disease pushed up costs.

That has made crop loss only sporadic. There was some incidence of disease reported in Nellore-Ongole area due to which some of the July-August crop was lost in November, but the Machilipatnam- Bhimavaram-Godavari areas have done pretty well. The next stocking season will commence after the winter chill in January- February.

Introduction of New Inspection Programme for Seafood Imports to US

The US will introduce a new seafood inspection programme, which will require India and other exporting countries to adopt the same rigorous system to sell their products in the American market.

The US Food and Drug Administration (FDA), which made this announcement said that the new programme was based on the hazard analysis critical control point (HACCP) system. It was originally developed by the Pillsbury company to ensure safe food for astronauts in space.

Under the new regulation, US imports are also required to verify that their overseas suppliers have adopted HACCP system to ensure that all seafood shipments have gone through the same rigorous procedures.

The US exported 2.12 billion pounds (valued at 3.03 billions) of edible seafood products last year.

FDA administration would adopt flexible attitude towards the small-size exporters in developing countries, including India.

Imports in the US would have several options. It was going to be a new burden for the US importing firms. But, it would benefit consumers.

The new programme was considered to be a state-of-the-art inspection system and was recommended for adoption by the food industry by the US national academy of sciences.

The HACCP system requires companies to identify and assess the key stages in seafood processing and handling, where food safety problems are likely to occur.

Control measures are to establish at these "critical control points", which are monitored to ensure that problems do not occur. This approach is different from other inspection programmes that rely heavily on an evaluation of products after they have been processed.

The US was not alone in recognising the importance of HACCP in assuring a safe seafood supply. Other large seafood consuming and producing nations have also implemented or will soon implement inspection systems based on HACCP principles.

Hong Kong to Import Frozen Chicken

Frozen imported chicken sales are expected to rise in Hong Kong because of fears over a deadly 'bird flu' virus and a mass slaughter of the territory's poultry.

Hong Kong slaughtered about 1.3 million chickens and other poultry to contain the deadly flu, which killed four people in the territory. Eight other have been confirmed with the illness.

The action follows the government's decision to ban all imports of live chickens from China, which supplies more than 70 per cent of the territory's chickens.

It is therefore expected that demand for frozen imported chickens will be much greater and the consumers in Hong Kong would switch to imported poultry.

NOVOD to Promote Sunflower Cultivation in HP

In a bid to enhance oilseeds production in new and non- traditional areas of North India, National Oilseeds and Vegetable Oils Development (NOVOD) has selected four districts in Himachal Pradesh for the promotion of sunflower cultivation as a spring (zaid) crop.

The sunflower cultivation in these districts will be undertaken using scientific methods like advancing sowing time from February to third week of January and popularisation of duration hybrids including a couple from abroad, maturing within 90-95 days.

NOVOD board, which has signed VMA Oilseeds and Research Development Institute (VMAORDI), has said that the initiative of the board would go a long way in enhancing the oilseeds production in new areas with enor-

mous production capacities in States like Uttar Pradesh, Bihar, Orissa, West Bengal and Madhya Pradesh.

Under the promotional scheme, 1250 farmers would be identified to be participants in "one-acre half-field demonstration" covering 500 hectares in Sirmaur, Solan, Una and Kangra districts of Himachal Pradesh.

Besides supplying the essential information on the method of cultivation, the farmers would also be provided with hybrid seeds.

Government Permits Large-scale Seed Exports

In a move to liberalise agribusiness, the Union government has for the first time permitted the large scale export of seeds of all the major cereals and oilseeds of the country.

Till now, seeds were a part of the restricted list under the Exim policy 1992-97.

The Government has decided that the seeds of 13 major crops can now be exported from the country without a licence, upto a maximum annual quantity ceiling fixed by the Ministry of agriculture. Both public and private sector seed companies, along with exporters, will now be able to sell the seeds of these Indian cereals in the world market.

Exporters will be free to export the entire quantity, irrespective of the ceiling. The exporters will have to inform the Agriculture ministry at least two months before the harvesting of the crop in question that they have a specific export order.

In fact, traders are now free to privately grow crops still on the restricted list and export the seeds even without giving advance notice to the ministry.

Traders who pick up seeds from the open market for exports will also be able to do so without a licence. The government will only intervene, if there is an emergency caused by a natural calamity and the seeds are required within the country. In such a scenario, the Government may lower the quantitative ceiling. The entire trade in seeds will be monitored by the Directorate-general of foreign trade and the Exim Committee of the department of agriculture and cooperation.

TIDCO to Open Network of Cold Storages

As part of its on-going efforts to attract investments in the food processing sector in the State, the Tamil Nadu Industrial Development Corporation (TIDCO) plans to establish a cold chain network to ensure availability of horticultural produces.

A study will shortly be initiated to identify possible locations to set-up a chain of cold storages and controlled atmosphere chambers, besides de-radiation centres throughout the State.

Establishing the cold chain network is part of a three pronged strategy to tap the potential of the food processing sector in Tamil Nadu.

A floriculture park over an extent of 200 acres at Hosur, near Bangalore, which will also have horticultural units and a dedicated perishables cargo centre at Chennai Airport are already being planned by TIDCO.

Nearly 40 per cent of the vegetables and fruits produced go waste for want for proper storage facilities and distribution lacunae.

The establishment of such facilities would ensure that the products reach the markets and food processing units in good condition, thereby enabling the growers to get better returns.

National Seed Corporation to Set up Greenhouses

National Seed Corporation (NSC) is negotiating a joint venture with a multinational to install tissue culture laboratories and green houses around the country.

The tentative cost of the venture is estimated at Rs 4-6 crores.

NSC has set a profit target of Rs 2 crores for the year 1997-98. The corporation is also planning to increase its cash credit limit to finance its working capital requirement from Rs 24 crores to Rs 30 crores.

The corporation will soon approach commercial banks for enhancement in the existing cash credit limit.

NSC earned profits to the tune of Rs 96 lakhs and Rs 65 lakhs in the years 1995-96 and 1996-97, respectively for the first time after a decade of consecutive losses.

One of the major reasons for this reversal in fortune was the increase in exports to neighbouring countries like Bangladesh and the West Asian countries.

Apart from the Ministry of agriculture, NSC, which supplies 45,000 tonnes of seeds every year, is supported by the World Bank and gets an interest rate benefit of 13.4 instead of the market rate of 15.5 per cent. Computerisation of the corporation is on the cards.

Rains Brighten Prospects for Rabi Oilseeds Production

Widespread rains throughout the country have brightened the prospects of better rabi oilseeds production this year.

However, the rainfall will have some adverse effect on the late sown ungerminated wheat and has also led to considerable delay in the uplifting of potato, consequently improving the chances of more area under cultivation for the sunflower in the northern states. Ungerminated wheat seeds used for sowing in this region have been hit by the incessant rains, compelling the farmers to use this area to cultivate short duration crops like sunflower. As the rain has also delayed the uprooting of potatoes by at least two-weeks, farmers will have to resort to cultivating oilseeds in place of wheat.

The main rabi season oilseeds are grown on rainfed and light soil and the current spell of rain will be beneficial in accelerating vegetative growth.

Agriculture experts have already predicted a ten-year low production of cotton during the current crop season owing to the reported impact of *EL Nino* and leaf curl disease.

Position of hybrid sunflower seed availability, which has been the limiting factor in the past is also very comfortable this year.

The present situation suggested that there were ample chances of the rabi oilseeds production hitting the production target of 106 lakh tonnes.

Unseasonal Rains Not to Affect Wheat Output Target : ICAR

The achievement of wheat output target of 68.5 million tonnes for rabi season 1998 will not be affected due to current unseasonal rains, according to the Indian Council of Agricultural Research (ICAR).

"The unusual rains would have both positive and negative impact on wheat output. In one way it would be good for the major wheat producing States of Punjab and Haryana, where sowing is almost over. We hope that the output target will be realised", the ICAR Deputy Director-general, Crop Science, Dr Mangala Rai said.

Sowing in about 80 per cent wheat growing area is over and only problem in this area is to monitor new diseases, pests and insects, which may grow due to high moisture content.

The current unseasonal rains however, may cause serious damage to the rabi crop, if there is any water stagnation at the already sown fields.

Wheat Prices Shoot up

There is a sudden spurt in wheat prices and it may not be too long before the common man may have to pay higher price for his daily bread. The price in the market has zoomed to Rs 800 per quintal from Rs 600 as the wheat moved up higher at Rs 625 to 650 per quintal from Rs 550 at Delhi and to Rs 600 at Khanna mandi.

Rise in wheat prices has had an impact on rates of wheat products also. The *maida* which was ruling at Rs 670 to 700 per bag of 90 kg, recently touched Rs 860-870 per bag. Similarly, even *rava* prices have touched Rs 860-870 against Rs 700-710 per bag.

Industry experts, opine that prices may continue to remain firm unless the Government arranges adequate imports immediately to augment the stocks during the present lean season. After a recent rise in the prices of pulses and edible oils, it now appears to be the turn of the wheat and wheat products.

Sugam Agro Exports First Consignment to Israel

Sugam Agro-Tech Ltd, engaged in the production of white button mushrooms, has announced the export of its first consignment of mushrooms worth Rs 11 lakhs to Israel. The export of two containers left for Israel in the third week of December 1997.

The company is also in the process of exporting two containers to United States and one container to Australia shortly. The company's products have fetched 30 per cent more than the standard price due to the product quality and the recent dollar appreciation would result in better price realisation in the international markets.

Meanwhile, the Sugam Agrotech is negotiating with a leading US trading company to join as a joint venture partner in its mushroom project. The US firm is actively considering the proposal of considering 20 per cent equity participation in the mushroom project. The project outlay of the mushroom project has been estimated at Rs 28 crores.

New Zealand Ropes Canada into WTO Over Pricing of Its Milk Products

New Zealand has joined the US in taking Canada to the World Trade Organisation (WTO) over its pricing of milk products. New Zealand alleges Canada's "special milk classes" scheme subsidies Canadian dairy exports.

New Zealand's agriculture ministry has instructed a its officials in Geneva to give formal notice to the WTO that they believed the Canadian scheme was against Canada's World Trade Organisation obligations and that they were exercising their rights to request formal consultations on the matter.

The complaint marks the first step in the WTO's dispute settlement procedure. If the two countries do not find a solution in bilateral consultations within 60 days, New Zealand can ask for the creation of WTO dispute panel, which would have six months to make a ruling.

Parry Agro Plans Diversification

Parry Agro Industries Ltd (PAIL), part of the Rs 2,600 crore Chennai-based Murugappa group, in an attempt to insulate itself from the cyclical fluctuations of tea business envisages to diversify into the other agro-based products.

The company is exploring the possibility of cultivating medicinal and aromatic plants. Further, it plans to launch algae on commercial basis, which is being cultivated as part of an integrated project.

For PAIL the bottomline is linked to the fortune of the tea industry. The company in an attempt to reduce the dependence on one activity has decided to diversify. With vast experience in the plantation and mass cultivation, the company has decided that all future diversifications would be in the agro-based areas.

The medicinal and aromatic plants cultivation and algae project fit in the game plan of the company.

The initial response based on preliminary investigations has been good for the cultivation of medicinal and aromatic plants. Further, the company may take some time to finalise the project details, but they would strive to match up to the needs of the market.

The construction of a plant facility for algae project has already started and the first lot of samples would be out during the first quarter of 1998-99, which would be followed with the commercial launch.

The algae project coming up near Pudukkotai in Tamil Nadu is estimated to cost Rs 9 crores. Besides algae cultivation, the company would also undertake processing and marketing of the products extracted from the algae.

The company plans to cultivate the algae which has a high percentage of beta-carotene.

Non-iodised Salt Banned

The Government imposed a nation-wide ban on the sale, possession or consumption of non-iodised salt.

An official notification, amending the prevention of the Food Adulteration Act, 1954, prohibits any person from selling or offering or keeping in his/her premises common salt for direct human consumption unless it is iodised.

But common salt may be sold for iodisation, iron fortification, animal fats preservation, manufacturing, medicines and industrial use under proper label declarations, according to the notification.

The Act also makes it mandatory to label the container/package as to whether it contains the permitted anti-caking agent.

Deficiency of iodine, which is an essential micro nutrient for normal human growth with a daily requirement of 100 to 150 micro gm. can have adverse effects on the foetus as well as on adults.

Major Food Laws in Effect

Though there are other laws that govern food products, the following seven are the most important for importers. A copy of each law can be obtained from the contact listed.

The Prevention of Food Adulteration Act (PFA), 1954, protects consumers against adulterated food and is comparable to the Federal Food, Drug and Cosmetic Act of the United States. PFA applies to domestic and imported food commodities, encompassing food colour and preservatives, pesticide residues, packaging, labelling and regulation of sales.

PFA lacks standards for many imported foods. Companies can request amendments of the law, but the approval process is complex and lengthy. Contact :

Mrs. Debi Mukherjee
Assistant Director General
Directorate General of Health Services
Nirman Bhavan
Maulana Azad Road

New Delhi-110 001
Phone : (011-91-11) 301-2290
Fax : (011-91-11)301-7924

The Standards of Weights and Measures Act, 1976, and **The Standards of Weights and Measures (Packaged Commodities) Rules, 1977,** regulate goods sold or distributed by weight, measure or number and their labeling. Contact :

Mr. P.A. Krishnamoorthy, Director
Directorate of Weights & Measures
Ministry of Food and Consumer Affairs
12-A, Jamnagar House
New Delhi-110 011
Tel. : (011-91-11) 338-9489
Fax : (011-91-11) 338-5322

The Essential Commodities Act, 1955, aimed at preventing hoarding, controls production, supply, distribution and trade in certain commodities including cereals, pulses, vegetable oils, cotton, various food items, soaps, and oil meals. For more information, Contact :

Mr N.N. Mukherjee, Secretary
Department of Consumer Affairs
Ministry of Food and Consumer Affairs
Krishi Bhavan
New Delhi - 110 001
Tel : (011-91-11) 338-4716
Fax : (011-91-11) 338-4716

The Fruit Products Order, 1955, regulates production and distribution of all fruit and vegetable products, sweetened aerated waters, vinegar and synthetic syrups. Contact :

Mr. P.K. Bansal
Director (F&VP)
Ministry of Food Processing Industry
Panchsheel Bhawan
Khelgaon Marg
New Delhi-110 049
Tel. : (011-91-11) 649-2087
Fax. : (011-91-11) 649-3228

The Milk and Milk Product Order, 1992, sets up an advisory board to advise the government on the production, sale, purchase and distribution of milk and milk products in the private sector. Contact :

Mr. Kawaljeet Singh
Deputy Secretary (DD)
Ministry of Animal Husbandry
Krishi Bhavan
New Delhi-110 001
Tel. : (011-91-11) 338-8534
Fax. : (011-91-11) 338-6674

The Pulses, Edible Oilseeds and Edible Oils (Storage Control) Order, 1977, maintains supplies and equitable distribution and availability at fair prices of pulses, edible oilseeds and edible oils. Contact :

Mr. N.N. Mukherjee, Secretary
Department of Consumer Affairs
Ministry of Food and Consumer Affairs
Krishi Bhavan
New Delhi-110 001
Tel. : (011-91-11) 338-4716
Fax. : (011-91-11) 338-4716

The Destructive Insects and Pests Act, 1914, and **Plant Quarantine Rules and Plants, Fruits and Seeds (Regulation of Import into India) Order, 1989,** prevent the introduction of exotic pests, diseases and weeds via imported products. Contact :

Dr. R.L. Rajak
Plant Protection Advisor
Ministry of Agriculture
Room No. 409
Shastri Bhavan
New Delhi - 110 001
Tel. : (011-91-11) 338-5026
Fax. : (011-91-11) 338-4182
-or-
Dr. Radhey Shyam
Joint Director and Head, Plant Quarantine Division
Plant Quarantine Station
ITI Airport-Terminal I
New Delhi
Tel. : (011-91-11) 329-5791
Fax. : (011-91-11) 329-5445

Other laws that may have an effect on food and food processing are the following :-

* The Prevention of Black-Marketing and Maintenance of Supplies of Essential Commodities Act, 1980.

* The Monopolies and Restrictive Trade Practices Act, 1969.

* Consumer Protection Act, 1986.

* The Trade and Merchandise Marks Act, 1958.

* (The Indian) Standard Institution (Certification Marks) Act, 1952.

* The Agricultural Produce (Grading and Marketing) Act, 1937.

* The Environment (Protection) Act, 1986, and The Environment (Protection) Rules, 1986.

VIEWS

Borderless Food Technology - A Giant Industry in the 21st Century

V. PRAKASH*

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(The 'VIEWS' Column is intended to permit eminent consultants, academicians and policy- makers to air their views on matters of prime importance to the Indian Food Industry. It is hoped that this new feature will facilitate to set in motion the process of serious thinking, situation assessment and action planning among the concerned people. It could also serve as a forum for debate where diverse opinions and views are expressed. Towards these ends, the VIEWS column, which as of now will be on invitation, will allow freedom of expression, not necessarily congruent with the Journal's views -

Chief Editor)

The need for addressing food preservation by hurdle technology and related areas is very appropriate in today's context of globalization especially for India with a flavour of tradition, culture and customs with emphasis on regio-specific agricultural raw materials. The need for raw material for the food processing industry is phenomenal, as one sees the investment growing up logarithmically. As indicated in some of the recent estimates, investments will nearly grow three to four folds by the year 2005. What one looks at from an agricultural and horticultural situation is the *specific variety* as well as the *required quantity*. But, there are other "raw materials" which are not only vital to the food processing industry, but also need to be considered as well as worried upon which has to grow parallelly with the requirements of agricultural and horticultural demands. We are justified to address this problem of 'hurdle technology' not only at the technology level but also how one can overcome the various problems from pre-harvest to consumer to marketing in the chain of operation of processed and semi-processed foods.

If India has to lead itself into the food processing change with which it has tremendous potential as the world's largest food factory, it has to produce more agricultural products.

India being the second largest food producer has nearly 25-28% of its GDP under food production and food processing and the above sector accounts for nearly 60-65% employment. Therefore, any changes or any stagnation in technologies will inevitably have a very high impact throughout the economy. We know that in India, the growth rate of agriculture is nearly half of that of the industry with industry growth put around 8% per year. If India has to lead itself into the food processing change with which it has tremendous potential as the world's largest food factory, it has to produce more agricultural products. When we compare the figures with those of China, it is rather clear that of our per acre food production must increase. This has to compensate also for nearly 50% of its increase in current population in the next 30-35 years and to combat with lower levels of machinery used in the fields, it is a greater challenge indeed.

There are many things one has to do before one talks about food technology. The list is long but one can look at it from the points of pre-harvest technologies and agricultural practices in non-seasons using green houses for better global business, storage infrastructure such as zero energy chambers and cold rooms with modern infrastructure; transport trucks with modified and controlled atmosphere storages to cater to

* *Director*

Key Note address delivered at ***National Seminar on Food Preservation by Hurdle Technology & Related Areas*** *at Defence Food Research Laboratory, Mysore - 570 011 on 29th December, 1997.*

the above, processing lines with minimal processing time with a safety aspect underpinning HACCP and following GMP, adaptable packaging technologies for increasing shelf life; synergising parallelly the policy matters from the point of view of regulations, taxations and food laws to increase the bulk production in the processing sector and for a smooth operation of the processed food to reach the consumer at a competitively low price.

The entire schematics of such an operation is nothing but "entrepreneurship development". This does not include the end marketing technologies, which of course today is borderless with the system operating from the most sophisticated processed food to the less processed fresh food, wherein the customer is the king at the end of the chain. With shift in the food consumption pattern from cereals to dairy and meat products and such shift being more rampant in the rural areas, tomorrow's purchasing power is with growing middle class, which will drive the pattern of an evolutionary change in the market demand.

All this has to be intertwined with the human resource development of professionals, who can man this mega industry in the most scientific and professional way. What do we have to do in order to combat that 8-10 fold requirement of HRD in the next 5-7 years ? Professional personnel have to be trained to occupy important seats in the industry so that they can make sure that the right kind of product is delivered to the consumer with safety and at competitive price.

It is in this context that one could probably focus on the technology angle with energy conservation, global competitiveness and emphasis on primary processing with the value addition, happening in the secondary processing and possibly the packaging and ultra high processing technologies coming into the tertiary processing. Today, the farmer or the grower is the primary person who, with an excellent contract farming

Professional personnel have to be trained to occupy important seats in the industry so that they can make sure that the right kind of product is delivered to the consumer with safety and at competitive price.

understandings and varieties and with a little bit of training, can even go into the primary processing and safe transportation of the raw material with minimum loss. This would mean a lot in terms of

We are the ones who can make it and we are the ones who need to plan it and we are the ones who ultimately will also enjoy that tasty and nutritious food, which we can make it affordable.

saving on that fossil fuel to just transport the product minus water (to the maximum extent) to supply that raw material to the industry for value addition. This is synchronised by by-products in the factory, which must become the raw material for another industry and can possibly make more value-added product from the by-products. This is where hurdle technology can play a key role. Such a schematics would integrate the industries for the maximum use of the agricultural and horticultural raw materials.

It is from this angle that today we need to look at more sharp engineering aspects focussed with high science and R&D using the National institutions and University tie-ups alongwith R&D units in the production units to synergise for alliances and partnerships for bringing in a total manufacturing revolution in the food processing system to make sure that what we are growing in the fields gets the royal treatment for the royal customer with an edge of competitive price.

What I want to achieve in this communication is to mentally agitate each one of you in initially a massive thinking process of integrating all the systems that are available in Food Sector to us, underpinning science as the driving force towards technology and technology, in turn, the driving force for bringing in revolution and under that umbrella the path has to be clear for us to go forward in the right speed to the right place wherein one must also look at a total economic growth of the country, underpinning that human face and that human face is of that person, who today may not have the buying power. It is for the industry, through employment empowerment, through awareness programmes and through the overall economic growth, that can make him or her buy the foods (may it be fresh or processed) for getting the highest nutrition and of course the highest safety built into it. I am positive that each one of us, be it be a farmer, a grower, a non-Governmental organisation worker, the policy maker, the entrepreneur, the scientist, the technologist, the engineer and last-

ly but not leastly the customer, can all make it happen for that food, which is absolutely safe for that one year old kid and equally safe for that 90 year old man wherein we can make the difference for the world in the area of food processing in India as a giant in the next five years. Time is running out and we need to hold each other's hand, if a revolution in this area has to happen. We are the ones who can make it and we are the ones who need to plan it and we are the ones who ultimately will also enjoy that tasty and nutritious food, which we can make it affordable.

It is in this context that we cannot forget the rich heritage of our country, which is built into traditional foods and has a role to play in the health foods under-pinning nutrition. As we have seen in the developed countries, learning from them, we might have to focus largely also on the semi-processed foods, wherein the mother or the housewife should not lose control of that affection and love of manufacturing the delicious dish from the semi-processed food in the kitchen to put the label of family food to it, before it is being served either on the floor or on the table. It is these cultural aspects that India would look forward in the future as a strong family, which supports a strong industry, because there cannot be a bigger industry of food processing than the kitchen itself in everybody's home.

We need to focus on issues which have a large agenda to make India a global player of unlimited success in the field of Food Technology.

Therefore, tomorrow's success in the food industry in India depends upon how well the industry partners themselves and how well the R&D institutions and industries join hands for a successful partnership and alliance towards converting that scientific knowledge into value-added systems by improving infrastructure, improving linkages, adjusting taxation and food laws in a frame work of operation and drawing a very clear game plan, wherein India can emerge possibly as a super power in agro-based food industries with a focus on primary processing, which gives the value addition to the farmer and grower directly. This process will have many "Hurdles" but just like the 'Hurdle technology' which we are talking today for optimisation of the process. We need to focus on issues which have a large agenda to make India a global player of unlimited success in the field of Food Technology. The scientist, the technologist, the engineer and the entrepreneur can do it, provided we carry the farmer and grower along with us in our journey to reach a common strategic goal of economic empowerment. We can do it, provided we have the will.

FEATURE ARTICLES

Dressed chicken

Advances in Poultry Products Technology Research in India

Technologies for Value-added Poultry Products

Pollutants in Livestock Products and Their Detection

Edible Film from Shark Meat for Wrapping Frozen Seafoods

Mobilization of Available Resources for Adequate Protein Production

Advances in Poultry Products Technology Research in India

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Central Avian Research Institute, Izatnagar-243 122.

Introduction

Poultry production in India has registered a spectacular growth as evident from about 3.5-fold increase in egg production to over 28 billions and a record 33-fold increase in broiler production to the tune of 330 millions between 1975 and 1995. As a result, the share of broiler meat has rapidly gone up to 65% of the total poultry meat output of 5.78 lakh tonnes, constituting nearly 25% of the total meat production in the country. Poultry meat, particularly broiler, and eggs have great potential of becoming the major sources of animal protein supply in not-too-distant future. With the target production of 62 billion eggs and 800 million broilers by the turn of this century, the present per capita annual availability of about 31 eggs and 600 g poultry meat will rise to 62 eggs and one kg poultry meat by that year. This calls for greater emphasis on establishing a strong and vibrant poultry processing sector, which is gaining momentum with the installation of a number of large mechanised poultry processing plants, expansion of fast -food outlets and egg processing plants to meet the growing demands of processed poultry products and promote export for accelerating the growth of Indian poultry industry. In this context, work carried out in different areas of poultry products technology over the past two decades in our country has been, briefly, reviewed and some thrust areas of future research and development in this direction have been highlighted.

Egg Quality

Table eggs should have clean and intact shell, good interior quality and desirable flavour. However, about 12 to 35% of eggs marketed are either lightly soiled or dirty and its incidence is usually high in rainy seasons. Hence, a simple and cost-effective egg washing machine (Badrinarayana *et al.*,1968) and an egg washing (detergent-cum-sanitizer) powder (Panda *et al.*, 1969) have been developed for this purpose. Likewise, the incidence of egg breakage and decline in the quality of eggs during long distance transport could be minimised by the production of strong shell eggs, careful handling and oil-coating prior to transportation in 3 to 5-ply corrugated fibreboard boxes (Panda and Panda, 1973).

Poultry meat, particularly broiler, and eggs have great potential of becoming the major sources of animal protein supply in not-too-distant future.

At present, the eggs are usually marketed as they are produced. The dirty eggs not only detract consumers but are prone to rapid spoilage and may pose health hazard. It is high time to offer clean and graded eggs to consumers in convenient packs to stimulate more demand for eggs. In a recent study, Mahapatra *et al.*, (1989a) found no significant differences in nutritional and sensory qualities, except for yolk colour of eggs from *desi* and farm-bred chickens, which invalidated the misconception regarding superiority of the former eggs. Furthermore, Singh and Panda (1990) observed that quail eggs were as susceptible to quality deterioration as chicken eggs under ambient (32 $\pm$ 2^{0}C), storage, which can be minimised by effective preservation methods.

Preservation of Shell Eggs

Of the various methods of shell egg preservation such as thermostabilisation, lime sealing, oil coating and cold storage, the last two methods either alone or in combination are of commercial importance. The egg coating oil (EC-oil) developed by Panda *et al* (1966) has been found to be highly efficacious in maintaining the egg quality (Kumar *et al.*, 1969; Siddiqui *et al.*, 1972). Alternatively, groundnut oil mixed with 0.0125% BHT or an oil emulsion

(groundnut oil 100 ml, water 100 ml, triethanolamine 1 ml, agrimycine 20 mg and BHT 100 mg) formulated by Neelakantan and Santhy (1979) could be used. Eggs coated with EC-oil could keep well at 0.5^0, 13^0, 26^0 and 38^0C for 8 months, 60, 28 and 10 days, respectively, whereas the storage time limits for unoiled eggs at these temperatures are 6 months, 30, 7 and 5 days, respectively. Untreated eggs held under refrigeration (5^0C) for one month should be marketed within 5 days, while oil-coated eggs could be kept in good condition for 2 weeks at ambient temperature after removal from the refrigerator (Tandjin and Panda, 1972).

Dehydration and Freezing of Liquid Egg

Production of dehydrated and frozen egg products is currently very limited in the country. However, the export-oriented egg processing units, which are being established, will offer an important outlet for the disposal of surplus eggs. The manufacturing process for whole egg powder has been standardised (Iyengar *et al.*, 1969). A small egg breaking machine has been designed and fabricated by Mahapatra and Das (1983) which can be scaled up for commercial use. As an alternative to metal cans, spray-dried whole egg powder packed in flexible paper-foil-polyethylene (PFP) laminated pouches under nitrogen can be stored for one year and for 6 months without nitrogen at ambient (27^0C) temperature (Nirmala *et al.*, 1976). In a recent packaging (metal cans vs. flexibles) and storage trial over a year, Rao *et al.* (1993) found absence of *Salmonella* and coliforms and the total bacterial and fungal counts were also within the safety limits, regardless of packaging materials.

Liquid whole egg undergoes gelation upon freezing. However, the amount of gelation is more drastic in frozen egg yolk than in frozen whole egg, which can be inhibited or averted by colloid milling or use of food additives. A level of 0.02 to 0.03% pepsin (Panda and Reddy, 1968) or 10% sugar, 5% glycerol, 0.5% trypsin or 10% common salt (Sahu and Panda, 1982) was found useful in preventing egg yolk gelation in the order stated. However, pepsin treatment overcomes the disadvantage of restricted use of salted or sugared frozen egg yolk without any deleterious effect on its functionality and sensory quality of sponge cake made from it.

Further-processed Egg Products

A great deal of work has been done in our country to standardise the processes for manufacturing convenience egg products such as whole egg, albumen and yolk powder, albumen flakes, canned eggs, dehydrated scrambled egg mix (Rao and Sharma, 1987), omelette mix (Jayaraman *et al.*, 1976) and pickled quail (Tipshetti and Panda, 1978; Singh *et al.*, 1989) and chicken (Raikhy and Bawa, 1992) eggs. Some of the processes developed have been commercially exploited.

It is high time to offer clean and graded eggs to consumers in convenient packs to stimulate more demand for eggs.

Carcass and Meat Yields

Several studies have been carried out assess the influence of breed/strain, age and sex on the carcass and meat yields in broiler (Khar and Chopra, 1975; Pandey *et al.*, 1985), spent hens (Narayanakutty *et al.*, 1982; Kondaiah *et al.*, 1993), *desi* fowl (Rao and Pillai, 1986; Mahapatra *et al.*, 1989b), guinea fowl (Brar and Sandhu, 1985), ducks (Reddy and Rao, 1990), quail (Singh *et al.*, 1980) and pigeon (Keshri and Sharma, 1988). These workers have indicated a wide variation in the eviscerated carcass (including giblets) yields of 6-8 weeks old broilers (70.2-76.3%), WL spent hens (65.3-68.2%), broiler breeder culled cocks (76.5%), hens (74.2%), cockerels (72.06%), *desi* fowl (68.3-74.5%), guinea fowl (71.9-76.2%), Khaki Campbell ducks (62.1-74.2%), 5-weeks old Japanese quails (72.2-73.0%), 58-week spent breeding quails (66.4-74.7%) and pigeons (75-77%).

Of the cut-up parts of broiler carcass, breast yield varied from 22.1 to 29.8%, legs from 27.6 to 32.1%, back plus neck from 25.9 to 32.6% and wings from 12.3 to 14.5%. The meat-to-bone ratio in broiler is somewhat lower (2.7 - 3.2) than that of quail (3.3 - 3.6). In a comparative study on the cut-up yields of culled poultry, Khanna and Panda (1983) observed higher yield of breast in turkey (35.2%) than that of ducks (29.1-30.2%) or hen (30.5 - 30.7%) in relation to their dressed weights, and meat yields as 42.2, 29.9 and 41.8% of the live weight of birds, respectively. Some of the variations in these yield measurements could be attributable to processing variables, particularly chilling and methods followed for portioning and deboning of carcasses.

Tenderization of Poultry Meat

In order to solve the disposal problem associated with the spent hens and culled breeding stocks, attempts were made for the enzymatic tenderization of meat. The intraperitoneal injection of spent hens with 50 ppm papain, 12 hr, prior to slaughter (Babu *et al.*, 1979) or intravenous injection of papain at 25 ppm level, 5 min

before slaughter (Bawa *et al.*, 1985) has been found to improve the tenderness of meat. However, these antemortem treatments are cumbersome and commercially not practicable. As an alternative, Rao and Panda (1984) advocated that soaking of evisceraed carcasses for 3 hr in 0.05% papain or 0.075% trypsin in combination with 1% sodium chloride and 0.5% polyphosphate was a more effective way of tenderizing the tough meat of spent hens.

Chilling and Freezing

Conventionally, warm eviscerated carcasses are immediately chilled to an internal temperature of 4^0C in slush-ice or mechanical chiller and aged for at least 4 hr prior to freezing. Studies carried out on polyphosphate chilling of chicken, duck and quail carcasses have shown beneficial effect in terms of reduction in drip and cooking losses, improvement in functional properties (WHC, EC, etc.) and sensory quality and inhibition of lipid oxidation during storage. Besides, chilling of carcasses in salt plus polyphosphate solution has added advantage of accomplishing both brining and chilling simultaneously. Similarly, blending of hot deboned spent hen meat with a combination of 2% salt and 0.5% polyphosphate yielded superior comminuted meat product than salt alone (Kondaiah *et al.*, 1984).

Quick frozen (-30^0 to -40^0C; air velocity 1300-1500 f.p.m) broiler could be stored at -18^0C for a year, while slow frozen (-18^0C) broiler and quail carcasses in a still freezer could be kept satisfactorily for 6 months. Pandey *et al.*, (1991) studied the effect of repeated power cut for 6 and 9 hr daily on the keeping quality of frozen (-18^0C) broiler and found that the carcasses exposed to these freeze-thaw cycles remained acceptable for 4 and 3 weeks, respectively.

Further-processed poultry products

Cost-effective and efficient processes have been developed for a wide range of value-added, further-processed poultry meat products for catering to the growing demand of the consumers. Various components of spent hen, such as skin, heart, gizzard, ova yolk and separable fat have been incorporated into comminuted meat products for realising higher returns from spent hens and economical production of such products. A sliming solution consisting of 0.2% sodium pyrophosphate and 1% sodium chloride appeared better than traditional fermentation process for the processing of fresh sheep, goat and pig intestines as sausage casings, which can be preserved in 40% salt solution for 4 months (Kondaiah *et al.*, 1979).

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Cost-effective and efficient processes have been developed for a wide range of value-added, further-processed poultry meat products for catering to the growing demand of the consumers.

The various semi-convenience to convenience products developed include chicken essence (Baliga *et al.*, 1960), chicken soup powder (Sripathy *et al.*, 1961), canned chicken (Haleem, 1973), cured and smoked chicken (Chatterjee *et al.*, 1969; Sharma *et al.*, 1973), chicken barbecue and *tandoori* (Puttarajappa *et al.*, 1971), chicken skin snacks (Sharma *et al.*, 1986), gizzard pickles (Sachdev *et al.*, 1992) and comminuted products like chicken sausages, patties, nuggets, steaks, *kababs*, balls, *tikkas* etc. (Majhi and Panda, 1975; Mahapatra *et al.*, 1984; Kondaiah and Panda, 1992). Besides, meats from other avian species like ducks and turkeys have also been utilised for the production of sausages, sticks and pickles (Panda and Khanna, 1983; Khanna and Panda, 1984). Quail *tandoori*, pickled quail meat and battered fried quail (Singh and Panda, 1984; Panda and Singh 1990; Panda *et al.*, 1993) are other novelties to the range of meat products developed in the country. However, more work is needed to develop efficient and attractive packaging for these products to extend shelf-life and consumer's acceptability.

Poultry By-products

Effective utilisation of poultry by-products, which constitute about 26 to 34% of the live weight of poultry, as feather meal, offal meal and mixed by-product meal is of paramount importance from economic and pollution

control viewpoints. Work carried out in this direction has shown that feather meal processed at 3 kg/cm^2 pressure for 30 to 60 min has higher available lysine, methionine and *in-vitro* pepsin digestibility, but owing to the higher content of keratin, its use is limited to 4 to 5% in poultry ration. Similarly, offal meal autoclaved at 1 kg/cm^2 pressure for 45 min could replace 75% of fish meal in broiler starter ration.

Future Thrust

More attention has to be paid towards the minimisation of egg breakage and maintenance of egg quality in the marketing channels. Design and fabrication of improved egg transport boxes/egg cartons for retailing of clean and graded eggs and crates/modules for the transport of live birds deserve special mention. Commercial extraction of lysozyme from egg white, ultrapasteurisation combined with aseptic packaging for extended storage of liquid egg should be investigated and the technical specifications for the production of frozen liquid egg products be established on priority basis. More work should be undertaken for the development of value-added egg products in order to widen the outlets for table eggs. Further areas of investigation include improved packaging of dressed chicken and further-processed products, mechanical deboning of poultry meat, efficient disposal of spent hens/breeder parents, pesticide residues in egg and poultry meat, establishment of microbiological criteria for quality control of poultry products and efficient utilisation of poultry by-products.

There is also an imperative need to fabricate egg and poultry processing machinery/equipments indigenously, establish cold- chain facilities, evolve innovative technology for shelf-stable products, enforce strict quality control measures and establish efficient marketing system for transforming the nascent poultry processing sector into a more dynamic and versatile enterprise for sustained growth of Indian poultry industry.

Summary

Poultry processing sector in India has been receiving greater attention in recent years. In view of this, research investigations on the processing and preservation of egg and poultry meat, tenderization of meat from culled birds, development of value- added poultry products and utilisation of by-products over the last two decades in our country have been, briefly, reviewed. Suggestions have been made for the indigenous fabrication of both egg and poultry processing machinery/equipments, expansion of processing units, development of wide range of value-added poultry products, their improved packaging and quality control and effective utilisation of processing wastes for higher economic return and pollution control.

More attention has to be paid towards the minimisation of egg breakage and maintenance of egg quality in the marketing channels.

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Technologies for Value-Added Poultry Products

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Introduction

Present panorama of augmented world poultry meat and egg production has emerged from the stages of crisis and struggle. It is the result of qualitative improvement in biotic and abiotic factors including the thirst for easy and cost effective technology through contemporary developmental pathways, ultimately intended to provide better life styles and to bridge the gap between the haves and the have nots. Poultry products technology has long been identified as one of the effective tools for promoting productivity by means of diversified marketing and to a great extent, it helped in combating the menace of unemployment, poverty and social unequity. In the yester years, the emphasis laid on development of value-added poultry products could mobilise consumers' interests and fiscal resources to support fast food industry for the benefit of consumers, entrepreneurs and the processors. Linkage of success between product development and their storage stability urged the researchers to work for quicker solutions through better perception of problems and advancement of knowledge. Such impetuses resulted in outstanding research contributions particularly in the areas of poultry processing and preservation, paving way for establishment and involvement of more number of Centres for Advanced Studies, Professional Universities and launch of integrated human resource development programmes. After the end of cold war, the changing priorities of trade have made it obligatory to concentrate on developmental activities with competitive superiority to obtain qualitative productivity of food products for all sections of society. Open market economy adopted by many countries has also added to the avenues of intensified international understanding, harmony of thoughts, trade and globlisation of commons. But in view of the hunger threats from inflating size of human population, the energy resources have to be conserved, collected and rationally utilised to match the incessant demands. There is a need for persistant hunt for modern technologies perfected through rigorous evaluations for accuracy, authenticity and appropriateness. International funding for development of research facilities particularly in developing nations could help them in attaining self sufficiency towards their R&D programmes. Abreast to it, the international cooperation on exchange of knowledge, tools and materials may be expected to render prosperity, social justice and dignified living. The scientific community and demographers must join hands in meeting the challenges to survival of humanity and fix priorities to substantiate the food stocks. Future technologies have to be based on promptness, cost, easy methodology and efficiency. Salient priorities deemed important for perspective technologies regarding value-added poultry products have been discussed in this article to offer think pool to the researchers, policy makers and the industry people.

Poultry products technology has long been identified as one of the effective tools for promoting productivity by means of diversified marketing.

International funding for development of research facilities particularly indeveloping nations could help them in attaining self sufficiency towards their R&D programmes.

Priorities

Today's fast developments in science and technology with quickest means of reporting and communication systems through satellite channels have made it essential to work with fortified zeal and vigour for immediate requirements of food industry, which contributes significantly to the worlds' most burning problem of providing nutritional security, employment and removal of economic apartheid. The competitive edge of modern techniques has potential of being profitably marketed to the user agencies, specially when productivity targets are being frequently revised to new higher expectations. Latest technology on enriched poultry products have to be standardised and popularised according to new vistas of thinking and the priorities thereof. Some of the steps apprehended necessary for giving boost to research harvests and their systematic application are submitted hereunder for consideration and future planning:-

(1) Innovative Approach

The concept of developing and utilizing biotechnologiical aids in food processing, analytical jobs and extension of products' shelf life has widely been explored. Achievements of first generation 'Soft biotechnologies' were confined to the integrated use of enzymic, immunological and genetic parameters for processing new products. But, it is very much pertinent that the functional properties of meat are optimised to ensure superior quality of the further processed food products. Advent of multistage scalding, minimum time process system (MTPS), requiring only 24 minutes against conventional 6-8 hours of processing and handling poultry carcasses, automation in evisceration, deboning, selection or quality-wise redistibution of poultry carcasses have been able to save time and energy with hygienically augmented meat yields. Such techniques acted as catalysts for development and improvement of mechanical facilities like water jet portioner for breasts, meat separator or automatic despatching machine. Besides positive gains from Pressure Technology (PT) in tenderisation of spent hen meat, the use of purified stabilised form of proteolyic enzymes through injections into vascular system of animals before their slaughter resulted in lesions of viscera and lymph nodes. Such intricacies and impediments need to be resolved through innovative approach and environment-friendly modes helping to recover higher quantities of proteins for their recyclic use in livestock and poultry nutrition.

The organisations unable to invest huge amounts on equipments manufacturing sophisticated poultry products have to be supported with suitable technology making use of indigenous resources of men, material and traditions.

The cost of production is a prime factor in deciding acceptability and success of products in the market.

Emphasis on product development certainly enlightens better scope of diversified marketing. In the context of prevailing economic structure, it will be more appropriate to develop wholesome poultry products for different classes of customers viz., elite, middle and low income groups. This might be possible by exploring the prestigious utilization of less-valued poultry organs like-gizzard, heart and skin. Role of new hydrocolloids, gelating and binding ingredients need to be evaluated. Closer multidisciplinary assocation of engineers and food technologists may be required in developing better efficient mechanical devices rendering organoleptically superior products, job-led state-of-art and competent entrepreneurship. The organisations unable to invest huge amounts on equipments manufacturing sophisticated poultry products have to be supported with suitable technology making use of indigenous resources of men, material and traditions. Testing and implem ntation of Hurdle Technology for extending the shelf life of poultry products offered new horizons of thinking. Marketing of intermediate moisture foods could help those not possessing elaborate refrigeration facilities. Such work needs to be continued and improvised to meet the requirements of people in remote areas and the defence personnel. **Central Avian Research Institute, Izatnager (India) has already perfected the technology suitable for hot and humid climates on quail egg pickle, chicken gizzard pickle, fried chicken gizzard and fried chicken liver.** Obviously, such endeavours were aimed at processing cost caloric products with extensive storage stability.

Present shortage of food energy resources cautions the need for strengthening innovative approach on all the relevent fronts so as to suit to the needs of people

particularly in the developing world. Joint venture collaborations in research may also venture economic strides and bring the developed and the developing nations closer for overall affluence.

(ii) Energetics

The cost of production is a prime factor in deciding acceptability and success of products in the market. Optimisation of minimum energy requirements for maximum production efficiency need to be done through audit of input-output energies, while preparing value-added poultry products. This could help in determination of capacity utilisation efficiency of processing equipments as well as estimation of their commercial and non-commercial energy needs. Such aspects form basis for balancing the cost and input-output energy ratios for lucrative marketing. Correlations estimated between caloric yields and input energy requirements have helped in calculating energetics per unit of currency spent. In addition to it, these observations formed basis for setting minimum norms and evaluation of technological gains aimed at achieving better production proficiency in the processing units.

Increasing trade of liquid or dried eggs and the value-added poultry products offers ample scope and challenge to the technologists in meeting the public demands.

(iii) Operations Research

Literally, operations research has been defined as the application of scientific methods, techniques and tools to operations of system with optimum solutions to the problems. It is based on identification of objectives, constraints or bottlenecks, controllable and uncontrollable factors and the role of authority entrusted with power of decision making. The derived strategies are thoroughly evaluated before being passed for execution and general use. Operational research should establish linkages between the past achievements and the modern concepts of science and technology particularly biotechnology, computer application and food engineering. It has also to set goals in the light of available resources and future needs. Lateral linkages with associated aspects of poultry processing like sanitation, disposal of sewage, transporation and market network have also to be studied to accelerate the pace of technological innovations. For carrying out the objectives of systems research, education and training play a very important role. On the one hand, it provides skilled persons for smooth operations and on the other, counselling, advertisements and consumer education would be helpful in supplementing the sale proceeds. Technologists have to be the part of systems research for the benefit of producers as well as consumers. Computer-guided mechanical devices need to be supported with accomplished mathematical models of possible solutions to the perpetual problems, their testing and finally developed software assets for wide range utility.

Literally, operations research has been defined as the application of scientific methods, techniques and tools to operations of system with optimum solutions to the problems.

Scope

Advantages of poultry production over other components of animal agriculture have very well been accepted on account of low cholestrol poultry meat and unadultrable highly nutritious eggs. **Total aggregate measures supporting the growth of poultry industry have to be properly utilized for increased outputs during the next century.** Statistical pointers showed 3 to 5% increase in egg production since 1984, which reached 733666 million eggs during 1994. Contributions from Asia have been maximum as compared to Europe, North America and other continents. Similarly, world poultry meat production in 1994 based on slaughter of 31.2 million chickens against 6.5 million chickens sacrified during 1961 showed about 5 times increase in productivity within this period. China and India have been the forerunners among top ten Asian countries rendering augemented poultry produce. Increasing trade of liquid or dried eggs and the value-added poultry products offers ample scope and challenge to the technologists in meeting the public demands. Easy and ef-

Novel techniques have to be evolved for reliable quicker and cheaper modes of analysing scientific parameters for the cause of food hygiene and public health.

fective technology could help, "production by the masses" to mitigate the food needs of the masses. Poultry meat as well as value-added products specially from less-valued organs preserved for longer duration at ambient temperature can facilitate easy tranportation and marketing. Eggs and newer egg products having prolonged shelf life particularly under variable tropical conditions can attract better entrepreneurship in addition to the acceptability among wider range of customers. Novel techniques have to be evolved for reliable quicker and cheaper modes of analysing scientific parameters for the cause of food hygiene and public health.

On the basis of these priorities and scope of further progress, it appears that sophisticated technologies for value-added poultry products are capable of taking the industry into new era of progress and productivity.

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ADVERTISERS' INDEX

Pollutants in Livestock Products and Their Detection

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Introduction

Pollutants or contaminants in livestock products (meat, milk etc.) can be defined as undesirable compounds that are present in a relatively small amounts as a result of intentional or unintentional human action.

Advancements in technologies of livestock rearing, disease control and intensive crop production system have increased the presence of various types of contaminants in livestock products. Further, with the trend towards higher production, coupled with processing of agricultural or animal products, the concentration of these contaminants has also increased. They can also be introduced due to incorrect storage of feedstuffs, which can get into the food chain through the use of industrial waste as feed or rearing of animals in the industrial zone or affluent discharge area. Various contaminants in the form of residues in foods of animal origin i.e., meat and milk have caused concern and their estimation has been regarded as an essential component of quality control programme.

Hecht (1989) classified the residues/contaminants into three groups:-

(a) Naturally Present Contaminants

This covers contaminants, which were naturally present and which have only got into the environment and thus into foodchain to any great degree because of modern agricultural methods and environmental contamination due to intervention of man in all fields of daily life.

(b) Contaminants Caused by Man

Substances and their residues in meat and milk that have been caused by man and were not formally present include all chemical insecticides and herbicides and also stalk shortening agents and products such as PCSs, medical drugs, anabolics and synthetic radioisotopes.

Pollutants or contaminants in livestock products (meat, milk etc.) can be defined as undesirable compounds that are present in a relatively small amounts as a result of intentional or unintentional human action.

(c) Secondary Contaminants

This covers undesirable substances or excess quantities of desirable substances, which arise during treatment and processing of livestock products or during their preservation. Desirable substances must be present in certain levels, but if present too high a level, they will leave undesirable residues behind. This group may include nitrites, nitrates, nitrosoamines from nitrite and meat components. Also, include in this group are benzopyrines from smoke house process.

Naturally Present Residues

These are classified into mineral and microbiological residues.

Mineral Residues

These can come from two sources by getting into animal via feed and thus into meat and milk by a process known as carry over. These are mostly heavy metals, which can be of *geogenic origin* i.e., naturally present in soil in high concentrations than normal. These are absorbed by roots and lead to contamination of fodder and eventually to food. This also applies to radiation contamination from natural radioisotopes such as the naturally radio-active potassium isotype K-40, which produces natural permanent radiation contamination of about 90 Bq./kg.

The second source of mineral residues can be brought by man into biosphere from natural deposits-a process known as *anthrogenic*, wherein the contamination of an area has been above its natural level by human intervention caused due to waste from mining or smelting like lead and mercury, contaminating the whole earth with relevant residues.

Coleman *et al* (1992) conducted an extensive survey to evaluate the levels of lead, cadmium, cobalt, zinc, copper, iron, manganese and nickel in animal tissues and reported that lead and cadmium were rarely detected in muscle (0.2-0.5% positive among 2314 samples), lead was infrequently detected in liver (1.8% positive) and kidney (2.4% positive). However, 46% of the livers and 78% of the kidneys analyzed were positive for cadmium. In another survey, in Germany, Kluge-Berge *et al* (1992) reported presence of lead, cadmium, mercury and arsenic in bovine and porcine kidney and livers. Only lead and cadmium exceeded maximum German levels in 0.4% of sample (0.5 µg) and 1.1 sample (0.5 µg), respectively, while mercury and arsenic levels were well below the German Guide Values of 0.1µg/g and 2µg/g. The distribution of several minor and trace elevents in meat has been reported by Tarafador *et al* (1991). Maggi *et al* (1979) reported levels of cadmium, chromium and lead in different food products of animal origin (Table 1).

Mycotoxins are products of toxigenic moulds (fungi) growing in foods and feedstuffs and cause many problems in livestock.

Microbiological Contaminants

Mycotoxins are products of toxigenic moulds (fungi) growing in foods and feedstuffs and cause many problems in livestock. The

Table 1 Mean Mercury, Chromium and Lead Residues (ppm wet weight) in Some Food Products of Animal Origin

Type of food	Mercury	Chromium	Lead
Beef fresh (National)	0.002	0.169	<0.050
Beef frozen	0.008	0.146	0.160
Beef canned	0.006	1.870	0.790
Beef braised	0.002	1.205	--
Beef roasted	0.002	–	--
Veal with tunny sauce	0.027	1.461	--
Pork fresh	0.003	–	--
Chicken fresh	0.006	–	--
Rabbit fresh	0.006	–	--
Pork products (cured, raw)	0.009	–	--
Milk	0.005	--	--
Cream	0.005	–	--
Yoghurt	0.004	–	--
Cheese	0.003	–	--
Eggs	0.004	–	--

– Not attempted

Source : Maggi *et al* (1979)

presence of residues in meat, poultry or dairy products is a cause of public concern. Moulds and *Fusaria* cause problems which might aggravate due to modern intensive livestock farming, wherein complete feed from silos has replaced mixture feed, which contains many toxins. This may be particularly of concern for the health of animal and may also leave higher levels of residues in liver, eggs and milk. Ochratoxin produced from *Penicillium* spp and some *Aspergillus* strains have been reported to accumulate in kidney rather than in liver and muscle. (Gracy and Collins, 1993).

Contaminants Caused by Man

Residues caused by man has been classified in different subgroups and are given in Table 2.

Pesticide Residues

These are persistent compounds that are very stable to environment and are mostly chlorinated hydro carbons or compounds that contain toxic elements such as mercury or arsenic. These produce actual residue after breaking in soil (Hecht, 1989). Animals, intended for use as food, take up pesticides via feed and water or are exposed in the course of their veterinary measures (Heise, 1992). Pesticides through food are sources of several mysterious diseases, which include cancer, epilepsy, liver and kidney dysfunction, somatic growth depression, neuritis etc. (Sandhu, 1992).

India is one of the largest manufacturers and consumers of pesticides in South Asia, with the total use of pesticide having been estimated to be 80,000 tonnes at present.

Pesticides have very high affinity for deposition in the body fat of animals and the amount of storage in body fat varies in different species and is generally in proportion to their concentration in diet and are also excreted through milk. (Sharma *et al* 1940).

India is one of the largest manufacturers and consumers of pesticides in South Asia, with the total use of pesticide having been estimated to be 80,000 tonnes at present (Singh *et al* 1996). Pesticide residues in meat, milk and their products have been reported by many workers (Tables 3,4,5 and 6). It is the general opinion that pesticide levels in all livestock products in India are below the MRL recommended by WHO/FAO. Yet, due to indiscriminate and increasing trend of their application, the levels of pesticides may, in near future, go beyond the accepted levels, unless awareness programmes of their hazards as well as regular monitoring of livestock product are applied. Also, there are pesticides, which have been banned by FAO/WHO, but are still used in this sub-continent, especially for malaria control and sanitation programmes. This may further aggravate the situation.

Persistent Compounds of Industrial Technology

This group contains substances used in modern industrial processes and not in agriculture. Chlorinated hydrocarbons such as PCBs, the diaxions or perchloroethylene play the main part, but organic metal compounds

Table 2 Classification of Contaminanats Caused by Man

Group	Example
Pesticides	DDT, lindane, hexachlorobenzol aldrin, dieldrin, methyl mercury etc.
Persistent Compounds of industrial technology	PCB, diaxans, perchloroethylene, tetra ethyl lead, benz(a)phyrene
Medical drugs	Antibiotics, Neuroleptics (Tranquilizers)
Performance enhancers	Anabolics, repartitioning agents, Cu-salt
Synthetic radio isotopes	1-1310, Cs-137, Sr-90

Table 3. Pesticide Residues in Different Livestock Products (ng/g) (ppb)

Type of product	n	DDT	HCH	Dieldrin	Aldrin	HCB	Heptachlor	Reference
Milk (India)	10	1.40	180.00	0.09	0.02	0.03	--	Kannan *et al* (1992)
Butter (India)	4	400.00	2800.00	740.00	42.00	1.70	0.04	----do---
Meat and animal fat (India)	25	100.00	480.00	8.30	2.40	0.61	0.09	----do---
Beef fresh (Italy)	20	4.20	3.20	0.50	0.10	–	0.40	Maggi *et al* (1979)
Pork (Italy)	10	30.31	37.39	5.97	2.59	–	1.25	Madareha *et al* (1980)
Chicken (Italy)	10	61.55	61.10	10.66	n.d.	–	3.27	----do---
Rabbit (Italy)	10	34.25	56.12	7.33	1.43	–	2.46	----do---
Lamb (Spain)	25	25.00	112.00	n.d.	n.d.	49.00	n.d.	Herrera *et al* (1994)
Pork (Spain)	76	--	51.00	2.00	n.d.	15.00	n.d.	----do---
Pork cured (Spain)	30	--	57.00	n.d.	n.d.	8.00	n.d.	----do---
Pork Balogona (Spain)	20	--	21.00	5.00	n.d.	9.00	n.d.	----do---
Cured pork sausage (Spain)	26	--	28.00	3.00	n.d.	18.00	n.d.	----do---
Fresh sausage with beef & pork (Spain)	22	--	18.00	n.d.	n.d.	10.00	n.d.	----do---
Fresh beef sausage (Spain)	12	...	41.00	n.d.	n.d.	12.00	n.d.	----do---
Fresh poultry sausage (Spain)	18	--	85.00	3.00	n.d.	85.00	n.d.	----do---

n.d. = Not detected
– = not attempted

such as tetraethyl lead in fuel, benzo (a)pyrene and other substances are also important. The levels of PCBs in meat and milk products have been reported (Table 7) to be well below the accepted levels, but due to modernisation, its levels alongwith other compounds are expected to rise, unless measures are taken to control them. The problem with these residues is that these occur in feeds at only very low levels but because of their high resorption rates and long biological half lives and because they build up in animal fatty tissue, they tend to accumulate greater in the body of animals and excrete via milk. There is further accumulation, in the next link of the food chain, i.e., man and this can lead to critical PCB contamination of breast-fed infants.

It has been shown that cooking (grilling and roasting) caused little or no appreciable reduction in drug residues in meat particularly with chloramphencol, oxytetra cycline, amphiatine and sulphadimidine.

Medical Drugs

The medicinal drugs should not be problem, if used properly. Unfortunately, residual problem has arisen because these substances have been used improperly or waiting times have not been observed. Drug residues in meat and milk occur, when antibiotics are used for parental or oral treatment or as feed supplemented in food animals. Ingestion of drug residue in milk, meat and meat products by man may cause toxicity. Allergic reaction may develop in persons, who had been previously sensitized to antibiotics. Subsequent administration of these

Table 4. DDT and BHC Levels in Different Market Meats of India (μ/g)

Meat Source	DDT	BHC	Reference
Pig (Ludhiana)	0.630	0.120	Kalra and Chawala (1980)
Chicken (Ludhiana)	0.084	0.031	----do----
Sheep (Ludhiana)	0.015	0.013	----do----
Goat (Ludhiana)	0.056	0.002	----do----
Goat (Izatnagar)	0.390	--	Sastry and Singh (1981)
Buffalo (Izatnagar) (>10 years)	1.833	--	Tripathi *et al* (1973)
Goat (Lucknow)	0.150	--	Kaphalia *et al* (1985)
Goat (Hyderabad)	0.010	--	Lakshmi Narayan and Menon (1969)

drugs may culminate in allergic reactions, anaphylatic shock or even death (Schwabe, 1979; Okalo, 1986). It has been shown that cooking (grilling and roasting) caused little or no appreciable reduction in drug residues in meat particularly with chloramphencol, oxytetracycline, amphiatine and sulphadimidine. Roasting, however, reduces ampiciline by about 60% and chloromphenicol by 30%. Freezing at -20^{0}C causes no marked decrease in meat residues after periods varying from 7-33 weeks (Okalo, 1986).

Performance Enhancers

Performance enhancers are found in livestock products, if not used properly. These drugs are used for fattening of the animals. Martinez *et al* (1992) surveyed the epidemics arising due to illegal use of β-agonist in Spain and reported that most of the cases were due to consumption of liver from calves and beef from animals, which have been exposed to β-agonist, mostly clenbuterol, fed to animals for 3 to 8 or 9 months. Appearance of characteristic clinical menfestation subsequent to ingestion of meat is evident after a latency period between 30 min and 6 hrs. The clinical profile is characterized by muscle tremors and palpitations, tachycardia, frequently accompanied by nervousness, cephalagia and myalgia lasting for about 72 hrs. Use of β-agonist has caused two outbreaks of human food intoxication during 1990 in Spain and France (WHO Newsletter, 1991, Kenny, 1992). Clenbuterol concentration ranged from 160-291 μg/kg and 375-500 mg/kg in consumed bovine liver during outbreaks in Spain and France, respectively (Kenny, 1992).

Nitrites and nitrates are used for curing of meat, for imparting flavour, colour and also act as preservatives.

EL-Bouamy *et al* (1992) reported estrogen residues in imported frozen meat from different countries over a period of 1987-1990. Samples from Germany, Ireland and U.S.A. exceeded oestrogen concentration of 0.05ng/g. of tissue in 1987. However in 1988, only Ireland samples exceeded 0.05 ng/g tolerance. They also reported that local Egyptian chickens exceeded this limit over the whole period and the mean residue levels ranged from 1.140 ng/g in 1987 to 1.920 ng/g in 1988.

Synthetic Radionuclides

This group of residues come from atomic bomb test or from nuclear power stations or recycling

Table 5. Pesticide Residue Levels in Different Milk and Milk Products of India (μg/g)

Product	HCH	DDT	Reference
Dairy milk (Delhi Zone-I)	0.058	0.197	Mukherjee and Gopal (1993)
Dairy milk (Delhi Zone-II)	0.080	0.104	---do---
Dairy milk (Delhi Zone-III)	0.088	0.193	---do---
Dairy milk (Delhi Zone-IV)	0.086	0.108	---do---
Buffalo milk (Delhi)	0.166	0.220	---do---
Condensed milk (Delhi)	0.084	0.188	---do---
Cheese (Delhi)	0.110	0.345	---do---
Cream (Delhi)	0.132	0.382	---do---
Curd (Delhi)	0.022	0.042	---do---
Milk (Northern U.P.)	0.156	0.058	Kaphalia *et al* (1990)
Deshi Ghee (Northern U.P.)	1.105	3.839	---do---
Butter (Northern U.P.)	1.190	4.851	---do---
Butter (Lucknow)	1.134	6.410	Takroo *et al* (1985)
Whole milk (Lucknow)	0.313	0.218	Kaphalia *et al* (1985)
Milk (Pantnagar)	--	0.003	Tripathi (1967)

plants. Frindik, (1992) reported thorium and uranium (α-activity) contents in meats of domestic animals. The average activity of the main isotopes of thorium was 1-2 m Bq^{232} μ/kg and that of Uranium was 21-34 m Bq^{238} μ/kg of fresh meat. The contents were higher in cattle bones and hog kidney. This group of residue is accumulated in kidney and liver, being the organs of metabolism. Further, their biological half lives vary from animal to animal, such as Cs-137, which has biological half life of few days in rabbit and 80 or more days in horses or cows (Hecht, 1989).

Secondary Residues

Nitrosamines

Nitrites and nitrates are used for curing of meat, for imparting flavour, colour and also act as preservatives. Nitrites have excellent antibotulinium properties. However, nitrites form nitrosamines with secondary amines, which have been proven to be carcinogenic. Thus, the levels of nitrites have been recommended to be reduced and incorporated with other substances like ascorbates. As such, the council for Agricultural Sciences and Technology has recommended inclusion of 150 to 160 mg/kg of nitrite with 550 mg/kg of sodium ascorbate.

Although by themselves being inert, plastics contain a variety of low molecular weight compounds such as plasticisers, stabilisers, lubricants, un-reacted or partially reacted monomers and impurities.

Benzo(a)pyrene

Benzo(a)pyrene and other polycyclic aromatic hydrocarbons are the other secondary products, obtained during smoking of meat and meat products. These compounds have been demonstrated to be mutagenic and carcinogenic in numerous animal experiments.

Table 6. DDT Levels (µg/g) in Butter Samples of India

Place / State	Average	Range	Reference
Pantnagar	0.040	0-0.50	Tripathi (1967)
Delhi	3.800	0-8.00	Agnihotri *et al* (1974)
Punjab	4.280	3.57-4.87	Dhariwal and Kalra (1978)
Gujarat	10.420	9.41-11.36	Dhariwal and Kalra (1978)
Haryana	4.400	2.16-5.64	Dhariwal and Kalra (1978)
Rajasthan	4.210	3.62-5.21	Dhariwal and Kalra (1978)
Delhi	2.150	--	Dhariwal and Kalra (1978)
Lucknow	6.410	1.24-26.43	Takroo *et al* (1985)
Northern U.P.	4.851	--	Kaphalia *et al* (1991)

Toth and Potthast (1984) have reported various levels of benzo(a)pyrene in different smoked and barbecued meat products, ranging from 0.1 µg to 300 µg and have further recommeded that from the technological point of view, benzo(a)pyrene content of smoked meat product should not be more than 1 ppb. In charcoal- gritled meat, benzo(a)pyrene content has been reported to be between 1 µg/kg and 100 µg/kg (Ruiter, 1989).

Disinfectants

Another group of secondary products include disinfectants used in meat and dairy industries. Disinfectants that are not surface active can be completely removed from tools and equipments by rinsing with water. However, surface active agents adhere stiffly to most surfaces and cannot be completely removed by simple rinsing, especially quaternary ammomium compounds. Amphotensides can be removed to a greater extent, but not completely by rinsing.

When meat and milk come in contact with surface/equipment, disinfected by these compounds, it will take up part of the adsorbed material, thus leaving residue levels varying from few mg to 1 µg/kg (Ruiter 1985). The toxicity of these surface active components is generally low, but absorption of some nutrients by the intestinal tract may be partially inhibited. However, for disinfectants that are not surface active e.g., chlorine and chlorine-releasing compounds, it should be stressed that these have to be carefully removed from disinfected surface, as free chlorine may react with several meat and milk components, thus yielding substances, toxic properties.

Laboratory testing of residues involves highly sensitive instruments and dedicated skilled persons.

Components Migrated from Packaging Material

While glasses, tin plates and papers have been widely used as food packaging materials for many years, plastics are relatively recent innovation in the packaging of food, including livestock products.

Although by themselves being inert, plastics contain a variety of low molecular weight compounds such as plasticisers, stabilisers, lubricants, un-reacted or partially reacted monomers and impurities. Most of these have lipophelic properties and tend to migrate from packaging material to the fatty part of the food packed. Not all of these compounds are

Table 7. Residues of PCB's in Different Livestock Products of India (ng/g)

Source	n	Mean	Range	Reference
Milk	10	0.52	0.03 - 1.70	Kannan *et al* (1992)
Butter	4	6.00	2.40 - 9.30	--- do ---
Meat and animal fat	25	3.60	0.43 - 33.00	--- do ---

harmful to the consumer, but transfer of considerable amounts of these chemicals, from packaging material to food should be avoided especially vinyl chloride, used as co-polymers in vacuum packaging material, which is carcinogenic.

Detection of Residue

A simple procedure has been prescribed by Collin and Gracey (1993) for evaluation of residues from meats and in the meat inspection site (Fig 1).

Laboratory testing of residues involves highly sensitive instruments and dedicated skilled persons.

Instruments involved include Atomic Adsorbant Spectophtometer for metal ions, Gas Liquid Chromotography with ECD, HPLC, TLC for pesticides, HPLC and GLC for drug residues. Even recent technique of immunoassay has been used for detection of pesticides and drug residues.

It is essential to evaluate the livestock products, such as those from milk and meat for residual levels of contaminants especially pesticides, drugs, heavy metals etc. In India, there is no clear cut infor-

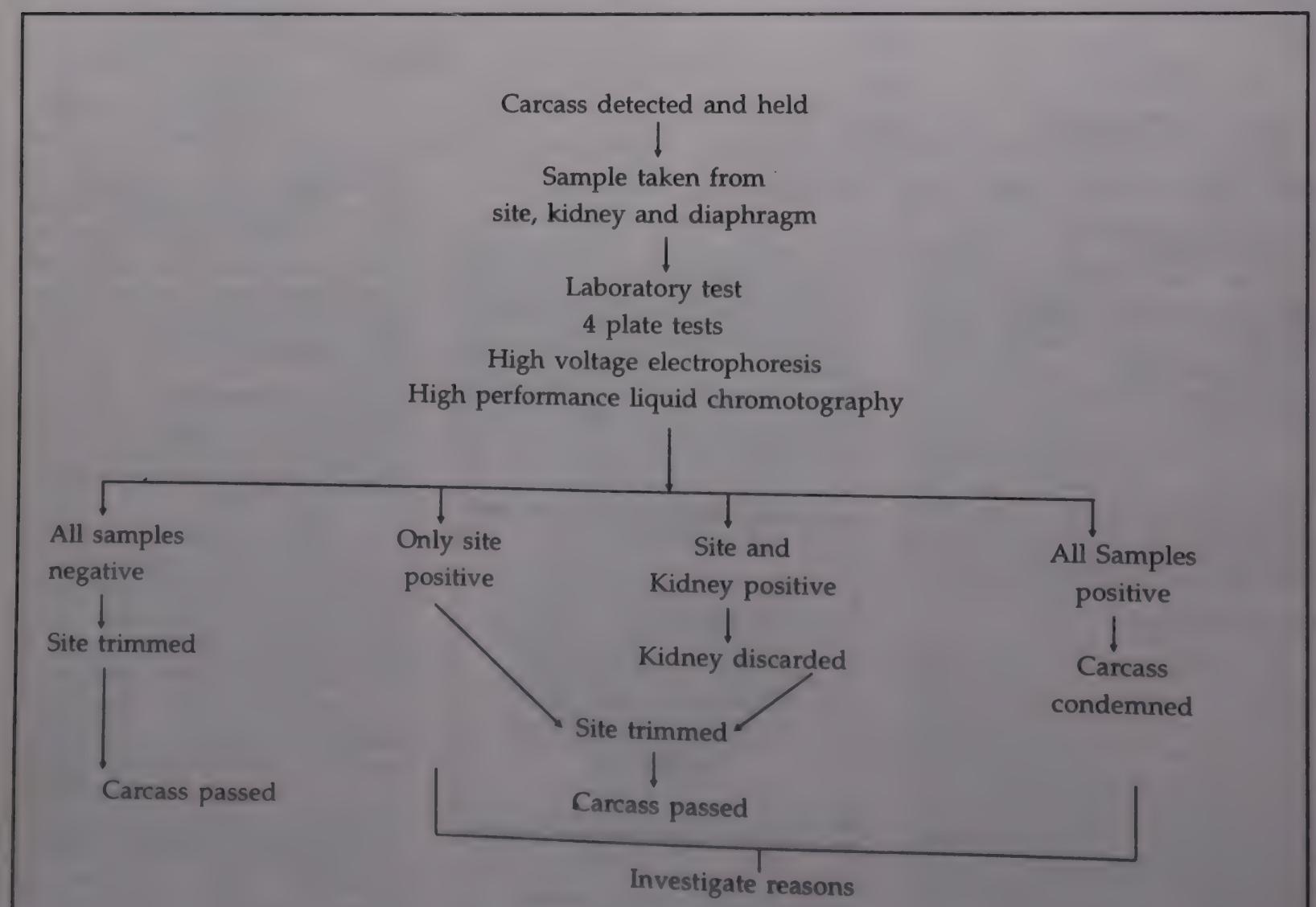

Fig. 1 Scheme for Meat Inspection

mation available about their content in all livestock products. Further, due to indiscriminate use of pesticides, drugs and disinfectants for animal husbandry practices and to overcome unhygienic practices and malpractising of livestock products, it is essential to have extensive research programme to monitor these contaminants in livestock products. Also, regular screening of animal and their products from heavy metals in contaminated area is a prerequisite.

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Edible Film from Shark Meat for Wrapping Frozen Seafoods

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Environmental hazards resulting from large amounts of synthetic packaging materials generated as wastes have been causing great concern. While recycling of packaging materials could be one way to solve the problem, attention is also being paid to replace synthetic packaging, as far as possible, with biodegradable and environmentally-friendly packaging material. Prospects of such films are particularly bright for the food industry, which has started realising that foodgrade macromolecules, possessing film-forming properties could be used for the development of edible protective coatings. It may be mentioned that the use of collagen casings prepared from animal intestines for packaging meat products such as sausages is one of the earlier techniques known to the industry. Although edible coatings and films cannot completely replace synthetic packaging materials for prolonged storage of foods, they act as adjuncts for improving the overall food quality, extending shelf life and possibly improving economic efficiency of packaging materials (Labuza, 1996; Kester and Fennema, 1986). Edible films have several features such as tensile strength, permeability etc. comparable with those of synthetic packaging materials, which make them useful in the food industry. The permeability characteristics help the films function as barriers to moisture, gas (oxygen) or solute and retain volatile flavour components, while tensile strength imparts mechanical handling properties to foods. These films can also function as carriers of food additives such as antioxidants and antimicrobials (Cuq *et al*, 1995; Krochta *et al* 1994).

Edible films have several features such as tensile strength, permeability etc. comparable with those of synthetic packaging materials, which make them useful in the food industry.

Frozen items formed a major produce of the muscle food industry including seafoods industry, where frozen shrimps and other shellfish constitute bulk of the trade.

Edible coatings can have several applications in processed muscle foods to maintain quality during handling and storage. Frozen items formed a major produce of the muscle food industry including seafoods industry, where frozen shrimps and other shellfish constitute bulk of the trade. The major quality deterioration during prolonged cold storage of such items is dehydration, resulting in weight loss due to moisture migration at low relative humidity conditions of the cold storage. This results in the food becoming irrecoverably dry and porous, a condition termed as 'freeze-burn' and leads to economic loss. In addition, oxidation of lipids, vitamins, flavour components or pigments during storage also occurs and these have detrimental effects on the sensory and nutritional qualities of the foods (Connell, 1995). These adverse reactions, which are dependent upon the proximity of the frozen food materials to gases such as oxygen and carbon dioxide, apart from storage temperature, can be effectively controlled by providing protective coatings to the food items. While, traditionally several synthetic films are used for the purpose, there is vast scope to use edible films as protective coatings. The protective ability of the films is determined by its permeability characteristics to gas and moisture. Further, edible films can also provide structural reinforcements,

improving durability during storage and distribution of frozen muscle foods.

Several varieties of edible coatings and films have been prepared from polysaccharides such as alginates, pectin, carrageenans, starch, dextrins and cellulose (Krochta, 1994; Kester and Fennema, 1986). Films have also been developed from various plant proteins and some of animal origin. These include corn zein, wheat gluten, soy protein, peanut protein, collagen, gelatin, casein, whey protein and egg albumen. The properties of the film such as tensile strength and elongation at break have also been summarised (Cuq *et al*, 1995). A few applications of edible films in muscle foods have also been reported. Egg albumen, wheat gluten and soy protein have been used as potential pre-dust materials and batters for batter-coated meats, chicken drumsticks and other foods (Baker and Scot-Kline, 1988). However, the potential of protein-based films for the preservation of frozen fish has not received much attention. Recently, edible films have been examined as coatings for breaded frozen fish in order to decrease the amount of moisture loss during frozen storage (Mu *et al* 1996).

There is large scope for development of edible films from the meat of under utilized fish-species, which can serve as coatings for commercially important seafood products and other muscle foods. A large amount of annual global fish landings comprises of by-catch, non-conventional and hence under utilized species. Nevertheless, the proteins from most of these fish are highly nutritive (Venugopal and Shahidi, 11996). A number of techniques for utilizing meat from under-utilized fish for product development has been pointed out, recently (Venugopal and Shahidi, 1995). While development of edible films could be a plausible way to utilize these fish, efforts in this direction have so far been hampered due to inability to get the fish proteins in a soluble and stable condition, so that the resulting solution could be dried to prepare the film. Our recent studies on gelation of fish muscle proteins under mild acidic conditions (Venugopal *et al*, 1994) and resulting possibility to prepare thermostable water dispersion as well as spray- dried protein powder (Venugopal *èt al*, 1997) have facilitated preparation of films from shark meat. A process to prepare edible film from shark, one of the under utilized fish species abundantly available in India has been developed. The flow diagram for the preparation of the film is shown in Fig. 1.

As shown in the Fig, skinned shark (*Scoliodon laticaudus*) meat pieces are washed and collagen is removed by passing the water homogenate of washed meat (meat to water ratio, 1:1.5) through a nylon mesh, when the collagen fibres are held on the

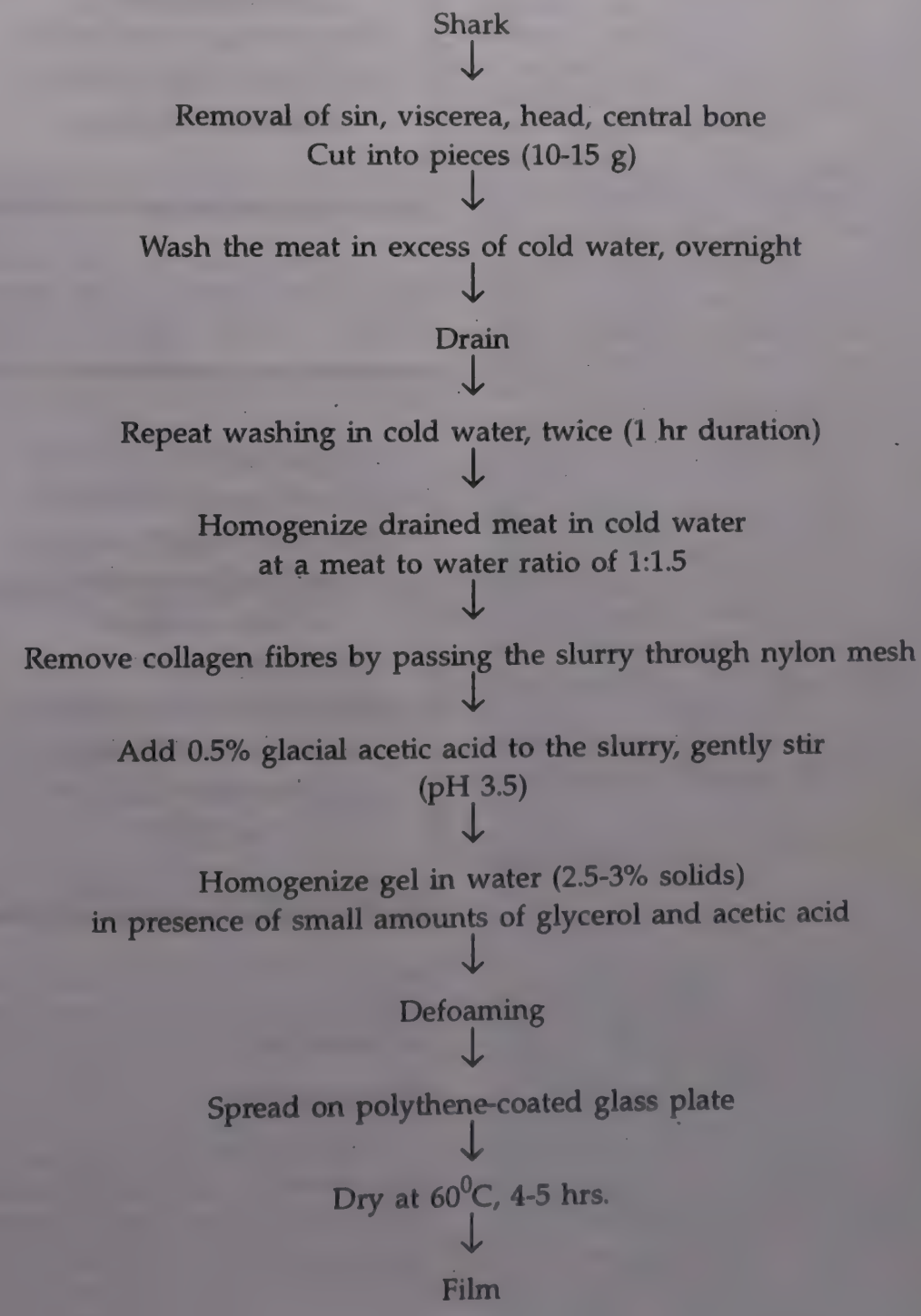

Fig 1, Flowsheet for production of biofilm from shark meat

mesh. Gel is prepared from the meat slurry by lowering its pH to 3.5 by dropwise addition of acetic acid, while gently stirring the slurry. The gel is homogenized in water in presence of small amounts of glycerol as plasticizer and acetic acid, as stabilizer. The homogenate is centrifuged at 1000g to remove foam and the dispersion is poured in thin layer onto a polyethylene covered glass plate. The film can be easily peeled off after drying the plate at 60^0C for 4 hrs. The film had an average thickness of 0.06 mm, tensile strength of 7.6-7.8 MPa, elongation of 4.6% and water vapour transmission rate of about 35 g/m^2/24hr at 38^0C and 90% relative humidity. It is possible to improve these properties by suitable changes in protein content of the dispersion used for film making, variations in the concentrations of plasticizer used and incorporation of certain additives such as polysaccharides etc. Films from some other under- utilized fish species such as threadfin bream, dhoma and croaker, apart from shark have also been prepared. In these cases, the fish meat is collected by mechanical deboning of eviscerated fish, which is subjected to washing and low-pH induced gelation (Venugopal and Shahidi, 1994). The film is prepared as described above.

The fish protein-based film can have potential as wrapping material for frozen high value seafoods such as shrimp, fish fillets etc., which are currently packaged in low density polyethylene films to prevent dehydration during cold storage. Recently, edible coatings from whey protein isolates and acetylated monoglycerides have been shown to offer protection against moisture loss and lipid oxidation in frozen king salmon (Stuchell and Krochta, 1995).

There is large scope for development of edible films from the meat of under utilized fish-species, which can serve as coatings for commercially important seafood products and other muscle foods.

Application of fish meat-based edible film to wrap frozen seafoods would offer a novel method for value addition of under- utilized marine resources such as shark.

Application of fish meat-based edible film to wrap frozen seafoods would offer a novel method for value addition of under-utilized marine resources such as shark.

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Mobilisation of Available Resources for Adequate Protein Production

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During the last few decades, efforts have been accelerated to develop new sources of proteins in order to meet the ever increasing requirements of the teeming millions. In fact, though there seems to be no protein shortage in the world, the maldistribution has created wide disparities between developed and the underdeveloped countries particularly with animal proteins.

With increased living standards, man has started increasing his protein intake to the levels that apparently exceed his physiological needs and more importantly, he switches from consuming cheap vegetable proteins to expensive animal proteins. The net result of this progression is, that more and more vegetable crops are grown, not to feed man but to feed domestic animals with a very low efficiency (6-7% for beef and 30% for milk). This craving for the animal proteins in the affluent societies puts an enormous strain on cereal production so that the cereal reserves in the world are diminishing. In the competition for cereals and food, the underdeveloped countries are on losing side. Therefore, the most logical way to increase the world protein supply would be to make more plant proteins available for human consumption and to develop production of unconventional proteins. Production figures and utilizable by-products of processing of some major foods are given in Table 1.

Conventional Resources

Better farming practices - The existing scientific knowledge has not been applied effectively in the form of action- oriented food production programme. Even in the developed countries, crop yields are considerably lower than the theoretical maximum productivity of the land. In developing countries, yields of basic food crops such as grain may be only one fourth of the yields in the developed countries.

Horizontal expansion of crop production, bringing new lands under cultivation, has been suggested as a way of increasing food supplies.

Horizontal expansion of crop production, bringing new lands under cultivation, has been suggested as a way of increasing food supplies. However, the heavy capital investment would be required for inputs such as farm machinery, irrigation systems, fertilizer etc., and this is where the policy makers in the government need to concentrate their efforts.

Vertical expansion of food production, increasing the yields on the lands already under cultivation probably represents the chief practical means of alleviating food shortages. The need is to apply scientific knowledge and latest technology, which we already have. Better farming practices would, of course, include the scrupulously planned irrigation systems and efficient use of fertilizers, both of which have a substantial influence on the food production.

Pesticides

These could increase food availability in two leading ways. They could vastly increase the amount of food obtained at harvest by controlling pests, which damage or destroy living plants and animals. In addition, they could prevent much of the enormous waste, which occurs after food is harvested. In some developing countries, more than one-fourth of the food harvested are lost due to insects, rats, monkeys, birds, molds and other forms of life. To minimise these losses, pesticides, as well as,

Table 1. Production Figures and Utilizable By-products of Processing of Some of the Major Foods.

	Production (X 1000 MT)		Utilizable by-product	
	World	Asia	India	
Cereals	1899434	929002	214893	Mill feed
Oilseeds :				
*Copra	4908	4163	470	Oil cake
*Palm kernels	4782	3583	37	Protein isolates
Cottonseed	34966	18967	4761	-do-
Olives	9132	1275	-	-do-
Groundnuts	26976	18808	7100	-do-
Rapeseed	33943	15393	5880	-do-
Soybeans	127566	22486	4600	-do-
Sunflower seed	26371	4094	1200	-do-
Potatoes	275941	79144	19000	as such
Beef & buffalo meat	56466	10422	2496	Offals, bones blood, processing waste etc.
Pig meat	82668	43128	420	-do-
Sheep & goat meat	10407	4789	647	-do-
Poultry meat	53716	17098	578	-do-
Hen eggs	42089	21160	1540	Rejected, broken eggs
Edible offals	14896	5138	498	as such
Total milk	537649	127144	65	Casein, caseinates co-precipitates etc.
Cheese	15589	881	3	Whey
Mariculture & Pisiculture produce	-	-	1700	as such
Krill (antartica)	500000	-	-	-do-

Sources : FAO (1996), Phelan *et al.* (1993), Nair, (1996), Joshi, (1994)

modern storage facilities and efficient distribution systems, which protect food from pests, are urgently needed.

Genetic improvement

Changing the genetic characteristics of plants or animals can increase the amount of food obtained and improve its nutritional value. A new strain of rice, optimistically called "miracle rice" has been developed. Compared to the natural varieties, it responds better to the fertilizers and produces much greater yields. "Miracle wheat" suited to the conditions of soil and climate found in many developing countries, may allow these countries to achieve self-sufficiency in grain production. The protein in a new type of corn has an amino acid pattern so superior to that of ordinary corn that its quality is comparable to that of milk proteins. There are also strains of cottonseed from which the harmful constituent gossypol, has been partly or completely eliminated.

Similarly, domestic animals can also be improved in a variety of ways through selective breeding.

Animal husbandry

Besides practising improved methods of management, breeding and disease control, nutritional

aspects, which constitute more than 70% of the cost of animal production shall have to be given a considerable attention. Feeding of grains to animals, which are otherwise suitable for human consumption, needs to be eliminated. They will have to be adjusted on the rations with higher levels of forage and industrial by- products and crop residues. Pasture lands need to be exploited to its fullest potential and the land suitable for forage production is required to be, extensively, brought into use. Most of the grains, good part of barley and oats and wheat, not meeting standards for human consumption remains available in some countries. If these are fed to monogastric animals, there is every reason that a high level of productivity can be maintained.

Pisiculture

Fish is one of the most important groups of animal food, being a cheap and rich source of easily digestible proteins. About 70% of our planet is environmentally suitable for pisiculture. Fish farming for economical reasons, must develop to a major industry, as they are very prolific and efficient feed converters as compared to livestock (rainbow trout needs 1g of feed to add 1g to its body weight). India with a coastal line of 6100 km has a tremendous potential and total mariculture and pisiculture produce is anticipated to reach 13 million tonnes, as against 1.7 million tonnes at present by 2000 AD.

Fortification

One of the classic ways in which protein resources can be increased is the improvement of low quality protein by supplementation with the amino acid most limiting in the proteins. This approach has been suggested for use on a large scale in many parts of the world to improve the quality of wheat, corn and other staple protein sources. Studies so far performed suggest considerable improvement of protein quality. by such supplementation. The advantage of this procedure is that no change in agriculture, cultural technology or feeding patterns is required. The cost of such supplementation is relatively low, of the order of 1-3% of the basic price of the cereal. At present, amino acids are produced by fermentation and synthesis.

Changing the genetic characteristics of plants or animals can increase the amount of food obtained and improve its nutritional value.

Unconventional Resources

Cereal proteins

Potential benefits from utilization of outer layers of the grains i.e., wheat bran, wheat shorts, rice bran etc. collectively called as millfeed, for use as protein food seem to be promising.

Fish is one of the most important groups of animal food, being a cheap and rich source of easily digestible proteins.

Amino acid composition data reveal that these proteins are better balanced in essential amino acids than proteins of wheat flour or polished rice. Wheat protein concentrate (WPC) from millfeeds by dry milling procedures and by wet alkaline extraction has been developed. At present, wheat gluten is produced in substantial quantities for a variety of food application. Corn germ flour is becoming rapidly available for its application in baked, canned, breakfast and other fabricated foods. Low cost oats protein products with excellent nutrient composition have been prepared from wet milling of oats. There are also limited industrial application for proteins of sorghum, millet, rice, barley and triticale.

Oilseed meals

There are enormous amounts of the oilseeds available in the world and this source of proteins can prove significantly helpful in ameliorating the protein deficiency in various parts of the world. The crops such as groundnuts, cottonseed, sesame, soybeans, coconut etc. are grown partly or entirely for the oil production. The protein-rich solid material, which remains after extraction of oil, has either been used as fertilizer or animal feed. This indirect contribution towards human diets is least efficient. If the same material is consumed directly by human without channelling the proteins through plants and animals, the protein needs of humans can be fulfilled efficiently to a remarkable extent. Protein isolates from soybean and other legumes and oilseeds play an important part in the manufacture of novel foods. They are already being used in food products such as meat patties, sausages, and a variety of other items. The isoelectric product (non-water dispersible) is being spun into an edible fibre from which meat analogues are produced.

Vegetable protein blends

Plant proteins can be combined so that the amino acids lacking in one plant are supplied by another in the mixture. *INCAPARINA*, made from cotton-

seed, corn, and soy, represents one of such mixtures developed. This and several other similar products have been recommended by the Protein Advisory Group of the United Nations for feeding of children, expectant and nursing mothers and other adult human beings, in the developing countries.

Animal proteins from dairy products

Secondary dairy products such as casein, caseinates, co-precipitates, whey, modified whey proteins and proteins from fermented whey contain highly nutritious proteins. These have been experimented with great interest for the reasons such as economics of casein and cheese production, environmental protection and above all, protein supplementation. There are several traditional means of utilizing whey in human foods e.g., in whey beverages and whey cheeses like Mesost and Ricotta. During recent years, the use of whey preparations in the food industry has increased. Whey is extensively used at present in baked goods, fruit drinks, sherbets, and candies. Of special interest is the use of whey proteins in adapted milk formulas or humanized infant foods. Whey proteins are reported to make a significant contribution to human protein nutrition through their application in the products like protein-rich weaning foods, emergency food mixtures, and in dietetic foods.

Animal proteins from meat, poultry and eggs

A severe loss of animal proteins in the form of the condemned animal tissues, visceral organs etc. from the slaughter house, is. inflicted, as these are rendered for inedible purposes. Processes similar to those used to produce fish protein concentrate have been developed for the production of edible meat protein concentrates from various offals and tissues. Incorporating the latest processing techniques, will further help enhancing the meat protein availability. For instance, a new mechanical deboning process has the potential of increasing the amount of available meat by 3-4%. The bones have been effectively salvaged for edible purposes by developing products like bone soup.

Protein isolates from soybean and other legumes and oilseeds play an important part in the manufacture of novel foods.

Blood containing approximately 17% proteins, has a tremendous potential of further enhancing the protein supply. Products like blood pudding etc. have been developed.

A good number of eggs received for hatching and in breaking plants are condemned on aesthetic grounds. Suitable methods for the recovery of the proteins from such material need to be developed.

Scientific knowledge now available to the meat and poultry industries could result in increasing the output of processed meat and poultry products by over 50%, through appropriate use of plant proteins as meat extenders.

Whey is extensively used at present in baked goods, fruit drinks, sherbets, and candies.

These technological innovations are of special significance to the under-developed countries, where the handling of meat for human use is almost entirely carried out in the un-organized sector. Un-scientific, primitive methods of slaughter and dressing result in a serious loss of animal proteins. Therefore, the need for a change over to scientific methods is strongly felt, resulting ultimately in alleviating the protein deficiency.

Unconventional meats

Unconventional sources of animal proteins from animals other than farm livestock are being increasingly tapped to meet the requirements and satisfy the fancy for such foods.

Crocodiles are being increasingly used as human food and the workers are simultaneously conducting research for safe and quality production of crocodile meat.

Dog meat is consumed in some countries and in some parts of the world, it is considerable a delicacy. "Kae Soju" is a rejunevating herbal meat preparation highly priced by Korean sportsmen. It is made from whole dog boiled with herbs and spices.

Horse meat constitutes a significant proportion of the diet in some parts of the world. The nutritive value and acceptability studies on horse meat have been carried out extensively and it is said to be of great value in fulfilling the protein requirements of the world.

Rabbit meat production is considered as an important aspect of unconventional micro-livestock farming technology for developing countries. Rabbits are highly prolific, ready for slaughter, when they acquire a body weight of about 2 kg at 2-6 months of age.

Wild animals

For tapping the unconven-

tional sources of proteins for human use, particularly in soils unsuitable for agriculture and livestock farming enterprises, Feral or forest farming technology is being developed in certain parts of the world. Wild herbivores generally yield more proteins per pound "on the hoof" than domestic species.

Deer meat production has acquired lucrative commercial proportions in countries such as USA, Canada, Russia, UK, Australia-New Zealand. In Botvana 60%, Ghana 70% and Nigeria 20% of the total meat production are contributed from wild animals. New Zealand Producing 2000 metric tonnes of venison annually. Among various antelopes, reindeer, elk or eland, moose, red deer, have been successfully cropped. Other species worthy of attention include, Capybera, a large rodent and Sirenia, a fresh water manatee and marine dugong. These are wholly aquatic and feed on aquatic weeds and plants growing in swamps and on lake margins, which contribute hardly anything to human nutrition. An adult manatee is between nine and fifteen feet long and Capybera adult, is about four feet long. Under Indian context, fast dwindling wild life needs strategic conservation measures, possibilities of scientific cropping in the farm set up need be carefully examined with species ecologically viable such as blue bull, Samber, Gaur, Yak etc.

Aquatic proteins

So far, the primitive methods of rearing low valued species in fresh water ponds resulted in a low production. But now polyculture, which relies on the growing together of a number of fish species of varying feeding types, presents opportunities to attain very high yields per hectare by taking advantage of symbiotic relationships among the different species. The high yield in such systems can be maintained without competing with non-ruminant farm animals for feed. Various species included in this system are carp, buffalo fish, tilapia, white amur, mullet, milk fish and cat fish. Besides this, shrimps and krill have been harvested to a considerable advantage, the latter being particularly of a great value as a source of proteins from aquatic origin.

Most species of mushrooms contain all of the essential amino acids and most of them are found in about the same proportions as in hen eggs.

Fish protein concentrate (FPC)

There are certain fish, which are otherwise unacceptable to humans such as "Trash" can be made into an inexpensive, tasteless, odourless powder, which has 80-90% protein of high nutritive value. Water and fat are removed from the fish and the rest is used for the production of FPC. FPC has been approved as being both wholesome and nutritious and it is now allowed for domestic use as well as for use in international food assistance programmes. When even small amounts are incorporated into staple foods, such as breads, FPC greatly increases the nutritional value of foods, without adding a detectable fishy odour, which would result in consumer rejection.

Single cell protein (SCP) is a generic term for protein produced through fermentation of petroleum derivatives or organic wastes by single cell organisms such as yeasts, bacteria, fungi.

Leaf proteins

The green leaves are the biggest repository of proteins in a plant and supply proteins to other tissues of the plant including seeds, which are subsequently used to nourish humans and animals.

The isolation process consists essentially of the preparation of extracts from fresh vegetation. Fresh plants are pulped and this pulp is pressed, giving an extract from which the proteins are coagulated by heating. This is followed by separating, washing and pressing the coagulated proteins, which have to be preserved. In this way, 50% or more of total proteins in green plants can be recovered in a 60-70% protein concentrate. Grass proteins are extracted in a similar way and from pressed liquor, the proteins are coagulated by heating to give a curd of 25-30% solids and the whey liquor is vacuum-concentrated to 55-70% dry matter. Curd and whey concentrates are then mixed together and spray-dried, retaining as the end product about 70% of the nutritional value of green material.

Potatoes

Potatoes contain 10-12% crude proteins on dry weight basis, although in the fresh potato, about 50% of this protein occurs as available free amino acids. Thus, the potatoes have the protein concentrations comparable with those of cereal grains, but its protein quality is much better and comparable with an animal proteins. Genetic improvement in the quantity of protein can prove of great

help. The potato is an excellent and inexpensive source of nutrients for the expanding populations and its versatility makes it adaptable to a wide range of environment.

Mushrooms

Mushrooms are a good source of proteins. Normally, they contain from 19-40% protein on dry weight basis. Most species of mushrooms contain all of the essential amino acids and most of them are found in about the same proportions as in hen eggs.

The cost of mushrooms is a function of labour costs, therefore, of greater value in developing countries, where labour is among the least expensive things. Modern mushroom culture produces more protein per unit area of land than any other form of agriculture. They may, therefore, become more available to the people of poor countries. Mushrooms can do much to alleviate protein shortages.

Protein biosynthesis

Single cell protein (SCP) is a generic term for protein produced through fermentation of petroleum derivatives or organic wastes by single cell organisms such as yeasts, bacteria, fungi. Some forms of SCP have been used as human food for millions of years. Any fermented food will contain significant quantities of micro-organisms as diverse as bacteria, yeasts and fungi. Thus, there should be nothing fundamentally repugnant about eating these organisms as foods. Some algae and protozoans, although not falling in the category of SCP in true sense, have been included in this group.

Some of the SCP products have already undergone complete chronic toxicity tests on animals successfully, but only extensive feeding tests in human beings can give final security. Indeed, several types of SCP, when fed regularly to humans, have been shown to provoke gastrointestinal discomfort, sometimes with nausea, vomiting and diarrhoea, as well as allergic skin manifestations. The important point in all these experiments is, that the materials had been tested previously on animals without detectable deleterious effects.

Preliminary results show, however, that purified bacteria, so-called second generation products, do not provoke these allergic reactions, indicating that for human consumption, the whole dried micro-organism is not suitable, but needs further processing to eliminate, not only nucleic acids, but other deleterious substances. In the future, at least three generations of SCP products are envisaged. First generation products are not suitable as food. They can only be used as animal feed. Second generation products could eventually be envisaged for use in food but, for the time being, safety and tolerance tests in humans are not extensive enough to allow their use in food. Third generation products can be envisaged as food ingredients.

Recently, the first genetically engineered food has gone on sale after approval from the UK Government's Advisory Committee on Novel Foods and Processes (ACNFP) and the Food Advisory Committee (FAC).

Antinutritional factors

These are of great importance, since they can limit the nutritional potential of food materials for human consumption. The two main antinutritional factors present are the protease inhibitors and the lectins (Phyto haemagglutinins). Seeds of the leguiminosae are particularly rich sources of these two anti-metabolites. Inadvertent consumption of these two agents has been shown to be toxic to experimental animals as well as man.

A third type of antinutritional proteins present in plants is the allergens (antigens), but unlike to toxic lectins and protease inhibitors, which exhibit their effects on any individual, who consumes them, they are usually normal food constituents and abnormality rests in the individual, who reacts abnormally to such otherwise innocuous substances.

Chlorogenic acid in sunflower protein products is a major deterrent to its utilization. However, numerous procedures have been devised for the extraction of these harmful compounds from sunflower kernels including solvent extraction methods. However, the economic feasibility on commercial scale is still questionable.

The toxic effects of these anti-metabolites present in plant foodstuffs can generally be eliminated by adequate heat treatment or other forms of processing.

Economic aspects

Although the great expectations of the aforementioned approaches have not yet been realized, the initial findings are still quite recent, and the goal is worthy of much additional efforts. However, these processes have to be cost- effective in order to be tenable on the industrial scale. According to Morris (1981) genetic engineering seems to offer a great potential for use in food production and manufacture. Applications of this technology to food processing will be designed to reduce costs and improve yields. Recently, the first genetically engineered food has gone on sale

after approval from the UK Government's Advisory Committee on Novel Foods and Processes (ACNFP) and the Food Advisory Committee (FAC). This product (tomato *puree*/paste) made from genetically engineered tomatoes is claimed to be cheaper than equivalent made from conventional tomatoes. Least cost formulations can be achieved from the process of fortification. Fortification, as well as improved technology, has driven costs down dramatically. A good example is the shrinking costs of enrichment. The cost of enrichment of 100 1b. of flour was $0.17 in 1941, $0.02 in 1967, and $0.0004 in 1978. It may be estimated that 70.85% of all flour produced in US mills is enriched. In developing countries, where there is little choice between a meat or vegetarian diet, cereal enrichment and fortification offers cheap effective solution to health and nutrition problems. As regards protein biosynthesis again, the SCP production has been shown to be economically far superior than other major foods, when compared on the basis of the energy consumption. Only 83.7 KJ input energy is required to produce a gram of SCP as against 167.5, 1101.1 and about 3500 KJ for rice, milk and meat, respectively (Schlingmann *et al.*, 1984).

Summary

The maldistribution of the food produced world over has widened the gaps between developed and the developing countries. This has led to a situation of man made, artificial shortage of the protein resources. The craving for least efficient animal protein production in place of more energy-wise efficient plant protein production has worsened the problem. In the competition for food, in general and cereals in particular, the people of the developing and the underdeveloped countries are the worst sufferers. In order to eliminate or atleast mitigate this problem, besides, recourse to better farming practices, judicious use of pesticides, genetic-engineering, improved animal husbandry practices, impetus to pisiculture development and fortification of the staple and other foods, production and consumption of certain unconventional protein resources have been suggested as remedy to this problem.

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NEW MACHINERY

Thin-Layer Chromatography

The Chromatotron, a preparative centrifugally accelerated, radial, thin-layer chromatograph, replaces prep TLC plates, small columns, and HPLC. It is suitable for pharmaceutical use, chemical labs, and universities. This has a capacity upto 500 mg per component, about 1 g total. It is compatible with all common chromatography solvents, including acetic acid and is used with silica gel, alumina, etc. The Chromatotron is compact and easy- to-move and operate.

For more details write to :

Merctek International Corporation, Dept CN

PO Box 3393, Santa Clara, California 95055, USA

Water Testing System for On-site Analysis of Water

Prerana Laboratories has developed a water testing system for quick and on-side analysis of water. The system includes test kits for water hardness, alkalinity, chlorides, silica, calcium and phosphates and also instruments such as pH meter, TDS meter, and thermometer. All test packs and instruments have been packed in a specially made handy carrying case for on-site use. The system finds applications in industries such as chemical, sugar, textile, and paper. Separate test packs for individual parameters are also available.

For more details write to :

Prerana Laboratories

C-17 Meghall, Orion Complex, Opp Ganesh Mandir

Aundh Road, Khadki, Pune-411 003 Maharashtra.

Energy-Efficient RF/Microwave Industrial Dryer

Mecord has, in technical collaboration with Sameer (Society of Applied Microwave Electronics Engineering and Research, Dept of Electronics, Govt of India), developed an energy-efficient industrial dryer. In this dryer, dielectric heating is done at radio as well as microwave frequencies. The material to be heated is placed in the high frequency field between two parallel plates.This is best suited to applications like drying of agricultural products such as starch and tobacco, vulcanisation of rubber, drying of textiles, yarn and paper, sterilisation of food, drying of hardboard and plywood, moisture equalisation of biscuits, bread, etc, drying noodles, pastas and papads, drying of pigments, etc. Since heat is developed directly in the material as the moisture present in the material absorbs these wabes, excellent uniformity, speedy heating, and moisture levelling can be achieved. This method also ensures a clean factory environment. Other advantages are prevention of overdrying, improved appearance and increased productivity. Customer-specific solutions are offered for drying using the RF/microwave dryers. In cases where hybrid dryers are essential, turnkey solutions are offered.

For more details write to :

Mecord Systems and Services Pvt Ltd

314 Hill View Indl Estate, Off LBS Marg

Ghatkopar (West), Mumbai 400 086

Plate Heat Exchangers

Praj Industries manufactures the Hinflux range of Plate Heat Exchangers (PHEs) for which the firm was recently awarded the ISO certification by TVV, Belgium. The Hiflux range, manufactured in collaboration with APV Baker of UK, includes conventional gasketed PHEs, welded pair for specific applications in airconditioning and refrigeration units, duo safety plates for pharmaceutical, food and dairy industries, brazed PHEs for chilling and condensing, and the exclusive plate and shell heat exchanger for high pressure applications. Also offered is a range of solutions for the process industry - air dispersion dryers, decanters and centrifuges, plate evaporators, sterile and hygienic filtration systems.

For more details write to :

Praj Industries Ltd

1216/6 Fergusson College Road

Pune, Maharashtra 411 004

Ribbon Mixer

The Murhopye "Ribbon Mixer" is fabricated with MS framework welded structure. The main body is totally made of 4

mm-thick stainless steel and the two sides are reinforced with MS plates to hold the bearing housing firmly for longer vibration-free use. Two sides are bolted to a cast iron bearing housing and fitted with heavy duty ball bearings. The main shaft is made of solid 50 mm dia stainless steel welded with two sets of three blades in opposite directions in a ribbon form, which ensures perfect mixing of ingredients in the shortest time and without disturbing the original structure of the material to be mixed. The main drive is an AC motor 2 HP connected to the heavy duty reduction gearbox and the main shaft through the couplings. To load and unload the mataerial, foldable lid is provided so that the mixing can be inspected without stopping the machine. Harvesting is made easy by the bottom slide valve opening. This can be used for gentle mixing of pharmaceuticals, ceramics, pesticide formulations, rubber, colours and pigments, plastics, adhesives and coating compounds.

For more details write to :

Murhopye Scientific Company

B-11, Metagalli Industrial Estate, Metagalli

Mysore - 570 016 Karnataka.

Automated Laboratory Fermentor

Murhopye Scientific Company has developed a laboratory fermentor, with modern electronic control, which can be used in microbiological, biochemical and pharmaceutical research for development and optimisation of fermentation processes in the production of chemicals, antibiotics, enzymes and organic acids. The unit is highly flexible and modular (from a fermentor for the cultivation of micro organisms in a batch culture to a fully instrumented continuous culture system), simple in design and equipped to minimise aseptic preparation and handling. The main vessel is made of pyrex glass cylinder incorporating stainless steel to plate with 16 ports for various entries. Hollow baffle-type heat exchanger serves the triple purpose - to control the culture temperature, as a baffle, and as air sparger. Provision for interchangeable sparger and stirrers make this equipment highly flexible in meeting the environmental demands of growing microorganisms. Completely modular electronic control system controls various parameters like RPM, air flow, pH, dissolved oxygen, foam and continuous culture, indicated in a digital meter that can be connected to a recorder. Provision of a signal output makes the equipment computer-compatible.

For more details write to :

Murhopye Scientific Company

B-11, Metagalli Industrial Estate, Mysore - 570 016 Karnataka

Temperature Sensors

Athena Controls offers a complete line of temperature sensors, including thermocouples, RTDs, transmit-ers and accessories. The features are given in a catalogue from Tudor Technology include technical information and specifications along with temperature EMF tables, ITS 90 for thermocouple materials. Also included are easy-to-use specifying guides that enable ordering custom thermocouple and RTD assemblies directly from the catalogue. The temperature sensors are used in a variety of industries and applications, ranging from process control and heat treating to food processing and electrical utilities.

For more details write to :

Athena Controls (India) Ltd

Near Inductotherm, Bopal, Ahmedabad - 380 058 Gujarat

Continuous Sealer

Indra offers an exclusive high-speed continuous sealer for packing tea, detergent, wafers, spices, etc in sachets. The table-top continuous running machine can be operated at domestic power supply and power consumption is around 0.8kW. A temperature controller is provided in order to seal different types of heat- sealable foils. Sachets made from BOPP, polyester poly, aluminium foil, pearl BOPP, paper poly and glassine poly can be sealed. Extra attachment is available to pack LDPE, polypropylene, HDPE, etc. The easy-to-operate and maintenance-free machine produces around 1,200 packs an hour. No change of part is required to seal different sizes of sachet. Various types of sealing rollers are available. The machine can be attached to any conveyorised production line.

For more details write to :

Indra

Shop No 2, Babu Chawl, Opp Triveni Nagar

Kurar Village, Malad (East), Mumbai 400 097

Ozone Generator for Water Treatment

Motive Powers Inc offers ozone generators from Bio-ozone Corporation, USA, having quarter century of experience in ozone treatment to water and wastewater. It offers not only hardware

ozone generators but technical expertise in designing systems selecting right kind of equipment and commissioning. Ozone dozing replaces chlorine treatment totally thus saving on running cost, safety from hazards, handling toxic gases, etc. It is 1.5 times more powerful in oxidising the organics or even inorganic. It cleans water, reduces the possibility of algae formation, removes colour and odour, reduces COD, removes suspended solids. Motive Powers Inc can offer system or equipment needing ozone from 100 g/hr to 2 kg/hr.

For more details write to :

Motive Powers Inc

B/19 Crystal Apartments, Sagar Malkani Complex

Jogeshwari (West),
Mumbai 400 102

Screw Centrifugal Pump

P. D. Pumps & Systems offers the Hidrostal range of pumps. The pump is suitable for solids handling by incorporating high efficiency and excellent solids handling into a single unit. This has been achieved by the development of screw centrifugal impeller in which the pumped media enters at a low entrance angle and then flows through a smooth, open channel in a low shear and low turbulence condition. Features of the Hidrostal screw centrifugal pump are : Capability to handle liquids three times 'thicker' than conventional centrifugal pumps (up to 5,000 cst viscosity) ; Truly non-clog design and capability to handle large solids size and long fibrous solids without any clogging unlike conventional centrifugal pumps (up to 250 mm solids size) ; The unique screw impeller design is capable of handling delicate materials and shear sensitive liquids without any damage ; Highly efficient due to steep, stable performance curves; Flat, non-overloading power curves; and Available in CI/SS 316 construction and monoblock, horizontal, vertical, submersible, immersible and portable versions. The pump comes in flow rates up to 1,700 litres/second and discharge head up to 90 mwc. Typical applications are in raw, unscreened sewage; viscous sludges, slurries and pulps; pumping paper stock in excess of 10% DSC; flocculated liquids without damaging the floc (activated sludge); contaminated industrial effluents and process waste containing fatty and bulky objects; and pumping of delicate materials such as live fish, fruits, vegetables without any damage and shear sensitive liquids such as latex, oily water, etc. The company also offers Hidrojet venturi aerators.

For more details write to:

P. D. Pumps & Systems

Spectrum, 1st Floor, Maneckji Wadia Building,

127, Mahatma Gandhi Road, Fort, Mumbai - 400 023

Instrument Sets Standard for pH Measurement

Sirius Analytical Instruments has developed an instrument which allows a user to measure pH accurately. pH (a scale for measuring acidity or alkalinity), one of the commonest measurements made in the laboratory, requires trained operators. This Sirius GLpH system sets a new standard of accurate pH measurement by automating all the steps. To measure pH, the user selects the method for measurement, places the sample in the sample position and presses "yes". An electrode holder with pH electrode, temperature probe and stirrer moves automatically from the storage vial through two water washes to the ready-to-measure position above the sample. It then lowers into the sample, where pH is measured. After measurement, the electrode is washed and stored in the pH 7 buffer solution between tests. For most measurements with the GLpH, only one-button operation is required. It self- calibrates automatically every hour (or other user-programmed time interval) and warns the user if calibration is out of specification. By automatically reminding the user to change buffers and wash solutions and to refill the electrode, easy maintenance is ensured. The results are stored in the GLpH-data.

For more details write to :

Sirius Analytical Instruments Ltd

Riverside, Forest Row Business Park, Forest Row

East Sussex, RH18 5DW, UK

Vacuum Pump Systems

QuSys offers the Busch range of vacuum pumps, compressors and associated equipment for industrial and laboratory applications. R5 series is a vacuum system and not just a pump. This most versatile air-cooled rotary vane vacuum pump with post - vacuum processing of re-circulating oil and of vapour, provides safe continuous operation with improved moisture and vapour handling capabilities. No hiccups are encountered in continuous run. Capacities ranging from 4 m^3/hr to 1,600 m^3/hr at 0.5 Torr. Ideal for laboratory to production in any industry. The once- through oil lubricated Huckepack pump is rated for continuous duty under the most severe corrosive conditions and has solvent vapour handling capability. It has a well proven track record worldwide.

Ideal for the most demanding applications. Capacities range from 100 m^3/hr to 630 m^3/hr at 0.5 Torr. The dry running single stage rotary screw non-contacting low vibration and noise level Cobra pump is utmost in vacuum. Ideal in solvent recovery, distillation, vacuum drying, transfer and charging most corrosive molecules. Capacities from 78 m^3/hr to 2,700 m^3/hr at 10^{-2} Torr.

For more details write to :

QuSys

6/309 Jogani Indl Complex, Near ATI, V. N. Purav Marg

Chunabhatti, Mumbai - 400 022

Filtomat Water Filters

BDK offers a wide range of automatic self cleaning water filters manufactured by Filtration Ltd, Israel. Based on innovative patented technology, these filters are suitable for capacity ranging from 25 m^3/hr to 1,100 m^3/hr. Filtration rating is from 3,000 microns down to 5 microns. Main features of filters are : Filtered water continues to flow to the system during backwash cycle ; small and compact, occupies minimum space ; Have large screen and hence provide large filtration area ; No external power is required for operation as it operates on inlet pressure ; Easy to handle and no foundation is required and can be mounted on line. Main applications are in industries such as process, steel, pharmaceutical, chemical, beverage, automotive, plastic, sugar, petrochemical and waste water treatment.

For more details write to :

BDK Marketing Services Pvt Ltd

47/48 Gokul Road,

Hubli - 580 030

Karnataka

NEW PRODUCTS

Solution Turns Liquid to Dust

The Stardust Super Absorbent is said to be a breakthrough solution that picks up liquids of all kinds, and of any viscosity, and turns them into dust. It is particularly suitable for petroleum products such as gasoline, motor oils, axle grease and by- products; water-, oil-, or epoxy-based paint, glycol (anti- freeze), all liquid or semi-liquid food substances including syrup, jams and jellies, peanut butter and vegetable oils; all bodily fluids including human and animal wastes and blood; and all chemicals such as herbicides, alkalis, solvents, and acids (except hydrofluoric acid). The absorbent has virtually unlimited uses as a dry absorbent that is safe in all applications. It will not harm soil, cement, asphalt, tile, plants, animals, or humans.

For more details write to :

Paradigm Intl Inc, Dept CN

17151, Gillette Avenue, Irvine, Callfornia 92614, USA.

Oils and Oleoresin, Natural Food Colours, Floral Extracts and Resinoids

Synthite offers oils and oleoresins, natural food colours, floral extracts, resinoids, dry flowers, etc. Available are oleoresins, obtained by solvent extraction, from a wide range of spices. These serve as convenient substitutes for raw spices in food products. By careful selection of parameters, oleoresins can be produced to meet the exact customer requirements. Essential oils are recovered from spices by steam distillation. Food colours, derived from natural sources, include annato, marigold, paprika, red sandalwood and turmeric, and floral extracts include jasmine, tuberose and mimosa. Resinoid is made from Indian Olibanum and is used in perfumery. Also offered are a range of seasoning, including meat, poultry, seafood, etc.

For more details write to :

Synthite Industrial Chemicals Ltd

Synthite Valley, Kadayirippu, Kolencherry

Ernakulam, Kerala - 682 311

Polypropylene Ball Valve

The Flowtech brand polypropylene ball valve is 100% leaktight and is ideal to check corrosion, erosion and pure fluid without high cost. This valve is suitable for use in chemical, pharmaceutical, textile, agriculture, food, dairy electroplating and photographic industries. It is available in sizes 1/2" to 6" in flanged and 1/2" to 3" in screwed ends. It has full port area due to which the fluid is delivered without any pressure drop. Three-piece design permits easy maintenance and inter-changeability of parts. Applications are in chemical, petrochemical, refining, fertiliser, sugar and water treatment plant. The valve is suitable for constant maximum temperature up to 90^0C and working pressure up to 10 kg/cm^2.

For more details write to :

Flowtech Valves & Fittings Co

771/A, Block P, Near Rasol Ghee Factory

New Allpur, Calcutta - 700 053

Diaphragm Valve

Venus offers a range of Trime Saunder's A type diaphragm valves having a seating arrangement of rubber diaphragm to suit corrosive fluid lines. This range is available in materials of construction such as neoprene, butyl, Hypalon, PTFE. These materials are lined to suitable hardness to protect the parts from corrosion. The diaphragm valve is ideal for industries like water treatment, chemical and fertiliser. Venus also offers Trine glass-lined diaphragm valve suitable for temperature from 50^0C to 200^0C. This valve is available in BSS and CI ASA-150 and sizes from 15 mm to 150 mm.

For more details write to :

Venus Enterprises

122, Narayan Dhuru Street, Mumbai - 400 003

Vibrating Screen Cloth

Jeetmull Jaichandlall manufactures vibrating screen cloth for vibrating machines in a variety of range, quality and material of construction as per IS : 2405. Screen cloth is generally made with square apertures of 0.5 mm to 150 mm. Rectangular

apertures are also made as per requirement and specification. Screens are made with wires of stainless steel, high carbon, high tensile, spring steel, copper, mild steel and galvanised wires of dia up to 16 mm thickness. Edge preparation is also done if required with mild steel and stainless steel sheet. Screen cloth is used for screening in industries such as sponge iron, coal, cement, mineral quarries, steel plants, oil, chemical, paper, construction, fertilisers, food processing, thermal plants, etc. Also manufactured are wire mesh, perforated sheets, PVC chain link fencing, welded mesh, demister pad, mist eliminators, wire conveyor-belts, garden fencing, expanded metal, stay wire, barbed wire and other products.

Fore more details write to :

Jeetmull Jalchandlall (P) Ltd

30-33, Goyee House, 109 Netaji Subhas Road, 2nd Floor,

Calcutta - 700 001.

Dextrose Syrup

Universal Starch-Chem Allied Ltd offers dextrose syrup for use in food, pharmaceutical, fermentation and confectionery industries.

Maize Gluten & Oil Cakes

These are also the products of the above company - maize gluten for use in cattle feed and poultry feeds; and maize oil cakes for use in cattle feed.

For more details write to :

Universal Starch-Chem Allied Ltd

Mhatre Pen Building, B Wing, 2nd Floor

Senapati Bapat Marg, Dadar (West), Mumbai - 400 028

Conductive Carton Boxes

Cir-Q-Tech Engineering offers conductive carton boxes for ESD protection during transportation, storage and mailing. The boxes are made from corrugated board having an inner conductive layer with a surface resistivity of less than 10^{-6} ohms/sq. The boxes offer optimal ESD protection under uncontrolled and controlled circumstances. Abrasive factor is nil (surface sealed), printability is excellent and humidity has no influence on the electrical properties. They are available in different sizes.

For more details write to :

Cir-Q-Tech Engineering

No. 20/2, 80 Ft Road, 4th Block, Koramangala

Bangalore - 560 034, Karnataka.

HDPE Bottle Ink

PIC's HDPE-bottle ink is specially developed for marking information like batch number, date of manufacture, expiry date, maximum retail price, etc. on HDPE bottles of oil, shampoos, ghee, etc. The inkers are slow-, medium- or fastdrying according to requirement and methods of marking.

Coding Ink For Packing Machines

PIC also manufactures coding ink for manual, semi-automatic and automatic packing machines like Blisterpac, Cartopack, Vertopack, strip foil pack, batch number coding and carton and label overprinting machines. Coding is stamped by the in-line printer attached with these machines. The ink gives a sharp, bright and shining marking on aluminium foil, cello-phane, glassine paper, plastic, PVC, HDPE, latex and laminated paper with very smooth and non-absorbent surfaces. Available in violet, black, blue, red and green, the ink is resistant to aromatic solvents, lubricants and spermicidals. Areas of use include : pharmaceutical, cosmetics, condom, vegetable oil, pesticide and insecticide industries.

For more details write to :

Process Instrumentation & Controls

301 Sheth Chambers, Marimata Lane, Rajmahal Road

Vadodara - 390 001, Gujarat.

Boiler Feed Water Treatment Chemicals

Goverson has developed an exclusive boiler feed water treatment chemical, Grick-80, which can prevent scale formation in boilers. The product maintains the required alkalinity in the feed water and keeps the scale-forming ions suspended till it escapes through the blow-down. It is available in powder and liquid forms.

For more details write to :

Groverson Aquachem Industries

8, Queen's Road,

PO Box 100, GPO

Amritsar - 143 001, Punjab.

RESEARCH ROUND-UP

New Technique to Detect Shrimp Disease

Shrimp farmers and batcheries in the country can now bid goodbye to their problems regarding the White Spot viral disease in shrimps. Dr. I. Karunasagar, Professor and Head of the Department of Fishery Microbiology at the College of Fisheries in Mangalore has discovered a DNA-based rapid detection solution to tackle the disease.

In a breakthrough, Dr. Karunasagar and her research team have formulated a highly sensitive and specific polymerize chain reaction (PCR) technique, which helps to detect deoxyribonucleic acid (DNA) fragments and even dormant viruses, which cannot be detected by conventional histopathological tests. The White Spot bacilovirus-infected shrimp had a short lifespan and a retarded growth pattern, which worried shrimp farmers in the country. Because of this virus, shrimp production in India had been reduced by 20 percent, which is roughly 40 per cent of the total forex earned by shrimp exporters. The PCR method can be applied to shrimp culture in the very early larvae stage and if found infected the entire stock can be discarded saving the farmer a lot of money, time and effort.

Dr. Karunasagar has set up a laboratory at the college, which is capable of undertaking the PCR test for hatcheries and farms individually and collectively.

Studies conducted indicated that a two-step PCR reaction could detect dormant viruses in apprently healthy brood stock, larvae or carrier crustaceans. At present, the College of Fisheries was the only facility in the country to be equipped to do such tests. The facility allowed the brood stock to be screened as soon as it arrived in the hatchery by a non-destructive sampling method. This would facilitate using only virus-free brood stock for larval production. Shrimp farmers would stock only screened larvae in their ponds.

Owing to the White Spot viral injection in Indian shrimp, shrimp exporters had suffered a setback and the entire consignment exported to European countries and the U.S. had been rejected outright. The yearly shrimp production had also come down considerably as export-oriented farmers were discouraged by the economic losses due to this disease.

However, the domestic market had by passed the threat of the White Spot virus infected shrimps and the hatcheries and farmers had allowed the infected shrimps, to be marketed. The medical field was yet to assess the damage to human tissues due to the consumption of infected shrimps. Hopefully, the White Spot virus would biologically disintegrate during cooking.

With the advent of the PCR method, Dr. Karunasagar hoped that the Indian Shrimp farming and export industry would make a beginning "with a clean slate".

Chips Help Conserve Fish

Researchers from Britain's Centre for Environment, Fisheries and Aquaculture Science (CEFAS) laboratory at Lowestoft on the east coast of England have used microchip technology in a long-term electronic tagging project and recording measurements of depth and temperature, have been able to reconstruct the tracks of plaice migrating between the southern North Sea and their spawning areas in the eastern English Channel or off the north-east coast of England.

Their findings, revealing hitherto unknown details of the fish's migratory movements, could have major implications for conservation of the species and the evolution of measures to protect stocks of the fish whose numbers are under great pressure.

The research is being continued under a joint programme with the European Commission, in collaboration with the University of East Anglia in eastern England and fisheries institutes in The Netherlands, Denmark and Belgium. So far, long-life electronic tags have been attached to more than 300 fish. Up to 700 tags are scheduled to be used over the next few years on both plaice and cod.

These results are judged to be important for fisheries policy because they can help to improve the accuracy of stock assessments and forecasts upon which catch quotas are based. Stocks of plaice in the North Sea and English Channel are currently at low levels and the fisheries are subject to restrictive quotas to ensure their recovery.

Centre for Environment, Fisheries and Aquaculture Science, Lowestoft, Suffolk, United Kingdom, NR33 OHT. Telephone : +44 1502 562244; fax : +44 1502 513865.

E-mail : j.d.metcalfe@cefas.co.uk

New Paddy Transplanter from ICAR

The Indian Council of Agricultural Research (ICAR) has developed a self-propelled paddy transplanter to reduce the back-breading manual drudgery of women involved in rice plantation in muddy waters.

The new machine, developed by ICAR's Central Institute of Agricultural Engineering (CIAE), Bhopal, can transplant eight rows at a time using mat type seedings. It can easily be used by women, according to the Director of the Institute, Dr. Gyanendra Singh.

Rice transplantation is largely performed by women. Manual transplantation requires long hours of bending and standing in deep, silty soil, which may cause foetal loss in early stage of pregnancy, gangrene and loss of nails.

Some State Governments like Punjab, Tamil Nadu and Kerala offer a 50 per cent subsidy to small and marginal farmers on the self- propelled paddy transplanter.

Dr. Singh said it took eight days by the machine to transplant one hectare. But if three to four farmers could use on one farm, then it would take two to three days to transplant one hectare. The eight-row transplanter can perform work equivalent to that done by 40 workers. It will be a good machine for custom hiring.

Dr. Singh said a study conducted by the institute had shown that female agriculture workers had lagged behind their male colleagues in use of improved crop production and processing tools and machinery. Several farm operations are done by women using traditional equipments or manually, which causes a lot of drudgery. Dr. Singh said CIAE was working on developing tools that would reduce drudgery on farm and in agro-processing. If women were trained in use of these equipment, it would not only reduce their drudgery but also broaden the income earning base of the family.

He said the institute had developed a riding type multi-crop reaper harvester for medium farmers for self use and custom hiring. The machine was 10 times less costly than the combines (harvester-thresher) being used particularly in northern States. It can be operated by women also. A private firm in Bina, Madhya Pradesh, has begun manufacture.

While a Rs 8 lakh-combine can reap 1.5 to 2 hectares a day, the new Rs 85,000-reaper can reap 1 hectare/day. Custom hiring rates of machine are also lower to about one-fourth than the combine. It is suitable for soybean, paddy and wheat. The big advantage in reaper harvester is that it has a 'bhusa' (bruised straw) attachment and gives back 'bhusa'to the farmer, while a combine does not.

The Institute is in the process of developing for agro-processing a small Soyabean Milk and Paneer making machine which would be ideal for women entrepreneurs.

Bacteria Get The Smell Out

Odour from food processing and sewage treatment plants that are caused by mercaptans, alkyl-sulfides and hydrogen sulfide are removed by sulfur-eating bacteria in a technique developed by scientists at Obayashi Corp. (Tokyo) and Hitachi Zosen Corp (Osaka), according to report in the Chemical Engineering.

The bacterial grow on 2-30 mm diameter ceramic pellets that are packed in a tower. Exhaust gas passes through the tower, from the bottom, in about 20 seconds, which is sufficient for complete odour removal says, Mr. Yoji Ishikawa, a scientists with Obayshi's Bioenvironmental Engineering Research Department (BERD).

Water is sprinkled periodically from the top to keep the bacteria active. Until now, there has been no single bacterial treatment method for all three types of compounds : Odours from mercaptans and alkylsulfides have been treated by bacteria that work at neutral pH and those from H_2S by acid loving microbes.

The equipment costs 'almost the same' as conventional activated carbon systems, but the operating cost is lower because regeneration is not needed. The companies solved this problem by means of bacteria that operate in a neutral environment. The main factor in maintaining that environment is the development of the ceramic pellets, made by mixing process sludge with an undisclosed component.

Protein From Wastes of Grain Based Distilleries

In China, distilleries discharge 13 to 15 tonnes of Waste Water per each tonne of alcohol made of grains. These waste waters are very polluting with BOD level of 20-30 g/1 COD.

A technology developed, using mechanical and biological methods allows to utilise these wastes for producing feed proteins and reducing BOD and COD level by more than 75 per cent. Dried grains obtained from the distillery waste waters contain 25 per cent to 30 per cent of protein and 11 per cent of raw fat. The final product has the following characteristics :

(i) Content of bio-feed raw protein not less than 40%.

(ii) Water content-not more than 13% and (iii) Ash content-not more than 9%.

Advantages are as follows :

a) Water utilisation ; (b) Reduction of BOD and COD levels by more than 75% ; (c) Low production cost ; and (d) New technology.

Stage of development : Commercialised in China.

Inputs required : Coal-500 Kg/t ; Power-400 Kw/t.

Production capacity : 10,000 tpa of biofeed.

Economic data : Production cost : Less than US $ 145 per tonne ; Average market price of biofeed protein : US $240 per tonne.

Haryana Scientists Develop 18 New Crop Varieties

In a landmark achievement, scientists at the CCS Haryana Agricultural University have developed 18 new varieties of different crops, which are superior to the existing ones in various traits.

The new varieties belong to crops such as wheat, maize, cotton, sugarcane, barley, black gram, methi and tomato.

This is for the first time that such a big number of varieties has been developed at a time. The university had earlier evolved about 130 varieties of field crops, vegetables and fruits. Some of these varieties are very popular among farmers of the adjoining States of Punjab, Rajasthan, Uttar Pradesh, Delhi and Madhya Pradesh.

The newly evolved varieties were COS 8436 of sugarcane, HS 182 of American cotton and HD 123 of desi cotton for release in the state, while another eight varieties namely WH 912 of durum wheat, HHM 1 and HHMS-2 maize hybrids, COH-101 of sugarcane, AAH 1 and HHMS-2 maize hybrids, COH-101 of sugarcane, AAH-1 desis cotton hybrid, HD 328 of cotton, BH 393 of barley and HM 350 of methi.

Emerging Biotypes of Rice Gall Midge in India

The rice gall midge, Orseolia oryzae Wood-Mason, an important insect pest of rice in South and South East Asia, has been known to be a major pest in India causing yield loss from 12 to 35 per cent. Consequent to development and cultivation of high yielding gall midge resistant rice varieties leading to the suspicion or prevalence of different populations or iotypes. Concerted efforts for 13 years through multilocation testing under the All India Coordinated Rice Improvement Programme confirmed the existence of 3 biotypes of gall midge in India which were characterized and designated based on the reaction of host plant differentials. Subsequently, a more virulent population, biotype 4 was identified during 1986 in the north coastal districts of Andhra Pradesh and Bhandara region of Maharashtra where most of the resistant varieties like Phalguna, Surekha exhibited extensive damage, by biotype 5 was detected in Nonocompu and Pattambi areas in Kerala where the cultures recording low damage against biotype 4 in Andhra Pradesh and Maharashtra, showed susceptibility. Latest results of the multilocation testing gave an indication for the existence of yet another new biotype in Manipur where biotype 3 was identified earlier. Attempts to locate sources of resistance to the emerging new biotypes were very successful. Identification and utilization of donors like Velluthacheera, Orumundakan, Ptb 10, Aganni, T 1477, CR-MR 1523 for biotype 4 and Eswarakora, Siam 29, ARC 5984 for biotype 1 in breeding programme facilitated in release of biotype specific resistant varieties.

DATA BANK

Exports of Cashew Kernels & CNSL

Year	Quantity (Tonnes)	Value (Rs. Lakhs)	Quantity (Tonnes)	Value (Rs.Lakhs)
1992-93	53436	74549	4258	381
1993-94	69884	104602	3625	290
1994-95	7700	124628	3807	244
1995-96	70334	124050	760	145
1996-97	68758	128104	1350	199

Import of Raw Cashewnuts

Year	Quantity(Tonnes)	Value(Rs. Lakhs)
1992-93	134985	37633
1993-94	191322	48270
1994-95	228109	69094
1995-96	222819	76008
1996-97	192285	64058

Edible Oil Imports From Nov'96 to Oct'97

Month	RBD Palmolein	Cotton-seed	Sun-flower	Canola /Rape	Soya-bean	Total
Nov'96	72,107	14,000	8,400	5003	-	99,510
Dec	70,432	-	-	-	4,000	74,432
Jan'97	87,350	8,000	48,932	-	3,600	147,882
Feb	62,384	-	73,932	-	-	136,375
March	32,561	-	51,026	-	-	83,587
April	66,945	-	20,267	7,200	7,500	101,912
May	140,301	3,000	52,084	-	471	195,856
June	64,692	7,920	44,400	15,000	6,975	138,987
July	132,981	-	27,602	-	12,300	172,883
August	163,366	-	26,300	-	10,600	200,266
Sept	178,076	-	45,133	-	1,009	224,218
Oct	156,028	4,000	12,190	-	-	172,218
Total	**1,227,22**	**36,920**	**410,32**	**27,203**	**46,455**	**1,748,12**

TRADE FAIRS & GET-TOGETHERS

IFCON-98

Preamble

Another IFCON is round the corner. Yes, five years have passed since we conducted the IFCON-93 at Mysore. Now, the IV International Food Convention - IFCON -98 jointly organised by the Association of Food Scientists & Technologists, (India) [AFST (I)], Central Food Technological Research Institute (CFTRI), Mysore, India and the Defence Food Research Laboratory, Mysore, India will the held in Mysore from 24th to 27th November 1998. The theme of the Convention is **Trends in Food Science and Technology - Global Perspective**

The Convention

AFST (I) has set up a tradition in organising seminars, symposia, workshops and conventions periodically, providing opportunities to its members to focus on issues related to food technology and allied subjects. Over 150 major conferences were organised during the past four decades contributing to a better understanding of the various facets of food technology by the professionals, industries and policy makers.

IFCON-98 will highlight the development in food science and technology since 1993 organised in collaboration with Government of India, Government of Karnataka, Council of Scientific and Industrial Research, Defence Research and Development Organisation, Indian Council of Agricultural Research, Indian Council of Medical Research, Ministry of Food Processing Industries, All India Food Preservers' Association and UNIDO. The Convention will provide a true opportunity for technology exposition and information transfer amongst participants. It will serve as a forum for an interactive discussion and dissemination of information between the academia, industry & scientific community. Besides this, the Convention will also be a venue for the CFTRI Alumni Association meet providing a rare opportunity to all those ambassadors in food science & technology from CFTRI, to converge and relive some nostalgic moments and to commit themselves to the future progress of their alma mater.

The Venue and Facilities

The Convention and the exposition will be in the CFTRI campus, where excellent facilities are available for holding conferences and symposia. Mysore is about 140 km from Bangalore, the capital city of Karnataka State and can be reached through road and rail. Bangalore is accessible from Mumbai (Bombay), Delhi, Calcutta and Chennai (Madras) by air in 80, 150, 160 and 40 minutes respectively by dialy flights. The weather will be pleasantly moderate in November at Mysore, at the most requiring some light woolen clothing.

Participation

IFCON-98 is focussed on R&D personnel, industry professionals, teaching faculties of universities, technocrats, quality assurance personnel, representatives from national and international institutions and organisations dealing with supply of food products, technologies and manufacture and those having an abiding interest in the production, handling, storage, processing and marketing of foods. About 3,000 participants in total are expected to attend the Convention. The participation of several international professional bodies like Institute of Food Technologists, USA, is also expected.

Topics and Subjects

The Convention will have general and parallel sessions on subjects of topical interest. General sessions will cover subjects of common interest such as frontier technologies, food quality and safety, packaging, food machinery, food policy, human resource development, pollution, international trade, energy management and futurology. Parallel sessions will focus on foodgrains, animal products, edible oils, horticultural processing, dairy products, institutional foods, surplus food management, sociology and anthropology of foods, food distribution and marketing, traditional food technology, rural development and biotechnology. Eminent invited speakers will spearhead the discussions in these sessions. Poster sessions will be arranged on specific dates to cover contributed papers based on original work in all areas of food science and technology.

IUFoST Workshop & Expert Meet

International Union of Food Science and Technology will hold a special workshop to focus on recent technological developments in extending the post-harvest life of perishable produce for international trade, which will be very much relevant to the pressing needs of developing countries, yearning to have increased share in world trade. In addition to this, a session to meet IUFoST experts will also be arranged.

Special Presentations

A series of special lectures by eminent scientists and technolo-

gists are planned to highlight the state-of-art in few frontier areas.

Business Presentations

Limited opportunities, and facilities are being made available for audio-visual presentation in the evenings by interested organisations as part of their business promotion package. Facilities for processes, products and machinery demonstrations are also being set up.

Food Exposition

Exhibition and display facilities highlighting a selective spectrum of food products, services, packaging, food ingredients, adjuncts, protectants and machinery are available at the Convention site for about 200 participants. The exhibition will promote active interaction between buyers and sellers in order to provide a source of information to participants and visitors.

Accommodation

Mysore City has over 3,000 hotel beds within a radius of 5 km of the Convention centre (CFTRI). The tariff ranges from US $ 15-25 for Indian style to US $ 40-75 for Western style accommodation. Limited economy class accommodation can also be arranged for participants near the venue of Convention. Being a tourist season in Mysore and with very large attendance expected during the Convention, it is advisable to intimate about requirement of accommodation atleast one month in advance.

Banking Service

A branch of State Bank of Mysore is located in the CFTRI campus within walking distance of all Conference Halls and a branch of Indian Overseas Bank at Yadavagiri, Mysore about a kilometre away. The Banks offer foreign exchange service also including handling of Travellers Cheques and cash.

Post Office

A separate Post Office with all facilities is already working within the campus and will be easily accessible to all the participants.

Visa for India

International participants may approach the respective Indian Embassies, High Commissions or Consulates located in their country/area for granf of Visa at least six weeks in advance of their travel.

Sight Seeing

Elaborate arrangements are being made to organise sightseeing tours on (date will be intimated later) to cover all places of tourist attraction in and around Mysore.

ABSTRACT SUBMISSION PATTERN FOR POSTER PAPER

START THE ABSTRACT TITLE HERE USING CAPITAL LETTERS

Follow with authors' names, full official address,

Start third line and any subsequent lines in heading, if needed, just inside the line.

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Leave one extra line space between heading and abstract paper. Start the paragraph leaving 3 spaces. Keep all the lines as wide as possible without touching the lines on either side of the box. Short citations are needed, insert them in parentheses and not as footnotes. If structures or other forms of illustration are used, drawing should be part of the overall abstract, not submitted separately. Use an electronic typewriter and preferably using the courier 10 or almost similar type and carbon ribbon, which would give 57 characters (letters plus spaces) per 165 mm lines. Before submitting the abstract, check retyped, but reproduced photographically. Please mail the abstract unfolded.

Deadline for submission : 31st August 1998

Author Presenting Paper
and Address

I have sent the registration form and fee to the IFCON Secretariat
Vide Cheque/DD/M.O. No. ..... dated .....
or AFST Receipt No..... dated.....

Signature

Registration

For registration, separate composite registration form is available on request and has been sent to all members. The details of registration formalities are as under :

Normally no registration fee will be accepted after 20th August 1998. Registration fee for spouses will be 75% of the prescribed rate. It is important that the Convention Secretariat receives the enclosed registration cum facilitation forms at the earliest in order to receive further information circulars. Cancellation is possible till 20th August 1998 and refund to the extent of 50% shall be considered. Registration fee is payable through Money Order, Demand Draft or Cheque. Payments may be sent in favour of "IFCON-98, AFST (INDIA)". Registration kits will be available to the registered participants.

Registration for IFCON'98

Registration fee is being charged at the following rates :

Class of Registration	Regular	Late fee after 20th August 1998
AFST (I) Full Members	Rs. 600	Rs. 1200
Life member	Rs.500	Rs. 1000
Student member	Rs. 300	Rs. 600
Non-Member (Indian)	Rs.1200	Rs. 2000
Non - Indian		
Full member	US $ 450	US $ 650
Life member	US $ 400	US $ 600
Non-member	US $ 500	US $ 700
Student member	US $ 250	US $ 400

a) Spouse/Guest (s) 75% of Registration Fee.
b) Spouse/Guest (s) are not allowed for Student member.

Foodpro '97 Showcases The Best of UK Food Technology

Foodpro '97, the second international exhibition and conference on food processing which was held from 10 to 13 December 1997 in Chennai (Madras), highlighted the best of UK food and food processing products/services, technology and expertise. The hugely sucessful trade event was organised by the Confederation of Indian Industry (CII).

Exhibition : The UK had a record 9 exhibition stands at the only country pavilion besides the US stand. The Indo-British Partnership stand sponsored by the UK Department of Trade and Industry (DTI) India Desk and the Fair Trades Support Scheme (FTSS) won the best participation award at the exhibition. The stand received around 150 business visitors a day.

At the exhibition Relco, UK sold their special tamper - proof, glass/plastic bottle sealing equipment and Insect-o-Cutor, UK sold their flying insect control products. Mono Equipment, UK displayed cake and cookie depositing equipment which was sold to an Indian company prior to the exhibition. The entire team was overwhelmed by the enthusiastic response from Indian companies and welcomed requests for information and assistance.

British Food Technology Seminar : On 11 December, around 110 participants attended this seminar held in Chennai in the margins of **Foodpro '97**. The seminar was jointly organised by the DTI and CII. The UK presentations which focussed on the technologies of companies on the visiting team were extremely well received by the participants. Several Indian food companies who attended the seminar were also delighted to meet the UK team at their exhibition stands and discuss opportunities for cooperation in areas of mutual interest.

Products/services from the British team included Volac International's new dairy feed technology, Ozone Industries' ozone generators, GMC Rapidaire's hand-clippers for closing bags and Chipping Campden Food Drink Research Association's technical/advisory services on product safety/quality and process efficiency.

Mr Mike Roberts, DTI's Export Promoter for the agrifood sector accompanied the team to Chennai. He alongwith Dr Ron Watkins, Chairman, Plant Science International, UK and Lord Edward Fitzroy of the DTI, who have several years of experience in agribusiness in the UK discussed the food technology sector with several Indian businessmen at the stall in Chennai.

BOOKS

Processed Foods & Beverages Directory 1997-1999

3rd Edition, Compiled Edited, Printed and Published by Norman J. Dasilva for the Proprietors, Amalgamated Press, Mumbai 400 001. pp 654, Price (India) Rs 500/- by post Rs 550/- Overseas US $ 50.00 by Airmail.

This publication is a comprehensive work featuring extensive listings of firms in the Foods & Beverages sector and related fields. The information contained in the Directory has been researched and compiled through use of questionnaires, which were sent to various firms listed in the previous edition published in the year 1992. The data were collated and the revised information was included in the present Directory, thus fulfilling the need of entrepreneurs and exporters/importers.

The Directory contains 6 sections. The first 3 major sections are divided into 3 parts in which the companies are listed in alphabetical order, followed by product headings.

Section 1 contains the lists of companies and addresses of Manufacturers / Suppliers of Processed Foods & Beverages (pp 9-222). Section 2 contains the lists of companies and addresses of Manufacturers / Suppliers of Ingredients & Additives (pp 223-312) Section 3 contains the lists of companies and addresses of Manufacturers/Suppliers of Food Processing/Packaging Equipment, Ancillaries & Suppliers (pp 313-568). Section 4 presents the addresses of Indian Exporters of Various Processed Foods & Beverages including Ingredients & Additives (pp 569-610)

Section 5 gives the addresses of Importers from overseas countries of Processed Foods, Beverages, Ingredients, Additives etc (pp 611-636)

Section 6 covers food-related Associations, Export Promotion Councils, Trade Organisations Research Institutes, Colleges etc. (pp 637-654).

The features of the publications are that (i) the reader may use contents page (p 15) as an instant guide to all sections.

(ii) Product-wise heading in each section will help check out the products/services (iii) Product headings followed by the companies listed under each may be referred to find out the names of companies/products/services and(iv) A classified guide is included at the beginning of each section for complete details of companies.

The publication will be very useful for both Indian and Overseas manufactures, exporters and importers of various types of Processed Foods, Beverages, Ingredients, and additives.

Order copies to :

The Amalgamated Press
Narang House, 41, Ambalal Doshi Marg,
Fort, Mumbai 400 001, India.
Tel : 2654184/2750268
Fax : 022-2641275
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